PDS-700/DS-700 Series

User Manual

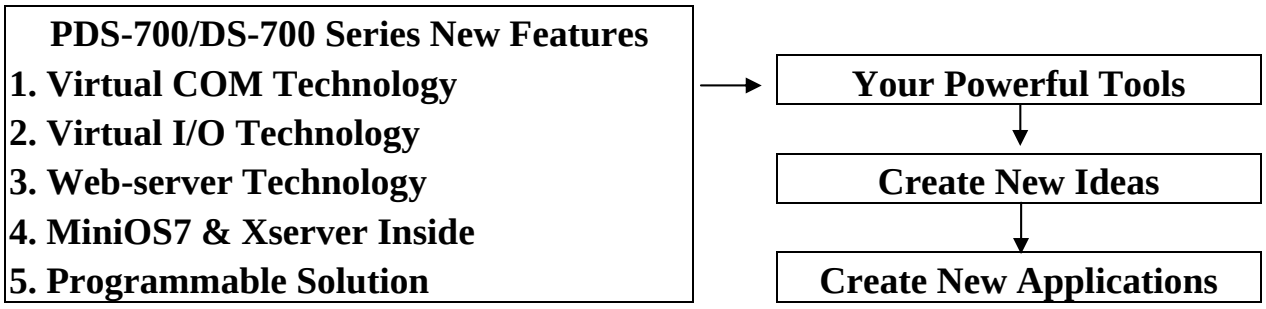

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Table of Contents

1. INTRODUCTION 6

1.1. WHY ETHERNET SOLUTIONS? 6
1.2. WHY VXCOMM TECHNOLOGY? 7
1.3. WHY WEB SERVER TECHNOLOGY? 9

2. TYPICAL APPLICATIONS FOR THE PDS-700/DS-700 10

2.1. RS-232/485/422 DEVICE NETWORKING 10
2.2. ETHERNET I/O APPLICATIONS 11
2.3. LINKING I-7000 SERIES MODULES TO AN ETHERNET NETWORK 12
2.4. CONFIGURABLE ETHERNET DATA LOGGER 12

3. HARDWARE INFORMATION 15

3.1. FEATURES 15
3.2. SPECIFICATIONS 15
3.3. PDS-700/DS-700 SELECTION GUIDE 20
3.4. PIN ASSIGNMENTS 21
3.5. PDS-700 WIRING CONNECTIONS 43
3.6. DIMENSIONS AND MOUNTING 45
3.7. PDS-700/DS-700 SERIES DIAGNOSTICS 47

4. SETTING UP THE PDS-700/DS-700 MODULE 51

5. CONFIGURATION WITH WEB BROWSER 58

5.1. CONNECTING TO THE PDS-700/DS-700 MODULE 58
5.2. NETWORK SETTINGS 59
5.3. IP FILTER SETTING 62
5.4. COM PORT SETTINGS 63
5.5. MISCELLANEOUS SETTINGS 69

6. VIRTUAL I/O 71

6.1. TESTING THE VIRTUAL I/O 71
6.2. VIRTUAL I/O COMMANDS TEST 75
6.3. PROGRAMMING ON A PC CLIENT 77

7. VIRTUAL I/O COMMANDS 85

7.1. $AA5 87
7.2. $AA6 88

7.3. $AAC 89
7.4. $AACn 90
7.5. $AAGCN 91
7.6. $AALs 92
7.7. $AAF 93
7.8. $AAM 94
7.9. @AA 95
7.10. @AA(Data) 96
7.11. #AAn 97
7.12. #AA00dd 98
7.13. #AA1ndd 99
7.14. ~** 100
7.15. ~AA0 101
7.16. ~AA1 102
7.17. ~AA2 103
7.18. ~AA3eff 104
7.19. ~AA4P 106
7.20. ~AA4S 107
7.21. ~AA5P 108
7.22. ~AA5S 109
7.23. Application Notes 110

8. CONSOLE / TELNET COMMANDS LIST 113

8.1. Operation Flowchart 113
8.2. Regulate Init/Normal Mode 114
8.3. Comparison Sheet (Init/Run/Console Modes) 115
8.4. Command List 116

APPENDIX A: LINKING TO A DEVELOPMENT PC 138

APPENDIX B: FRAME GROUND 141

GLOSSARY 142

1. Ethernet 142
2. Internet 142
3. TCP/IP 142
4. TCP (Transmission Control Protocol) 142
5. UDP (User Datagram Protocol) 142
6. Gateway 142
7. IP (Internet Protocol) address 143

8. MAC (MEDIA ACCESS CONTROL) ADDRESS 143
9. SUBNET MASK 143
10. ARP (ADDRESS RESOLUTION PROTOCOL) 143
11. RARP (REVERSE ADDRESS RESOLUTION PROTOCOL) 144
12. ICMP (INTERNET CONTROL MESSAGES PROTOCOL) 144
13. PING 144
14. PACKET 144
15. SOCKET 144
16. CLIENTS AND SERVERS 145
17. FIRMWARE 145

FAQ 146

1. HOW TO ACCESS THE REMOTE PDS-700/DS-700 THAT PLACED BEHIND AN NAT OR FIREWALL? 146
2. HOW TO OPEN A VIRTUAL COM PORT THAT LARGER THAN "COM 9" BY CALLING CREATEFILE() WIN32 API? 147
3. DOES VXCOMM DRIVER (PC) V2.00 WORK WITH VXCOMM SERVER V2.6.00? 148
4. DOES VXCOMM DRIVER (PC) SUPPORT AUTO-RECONNECTION AFTER FIXING A NETWORK BREAK? 148
5. WHY DOESN'T THE VXCOMM DRIVER (PC) RECEIVE DATA FROM THE 7188E/8000E/PDS-700/DS-700 MODULE? 149
6. DOES THE TRANSMISSION SPEED BECOME FASTER WHEN THE SERIAL DEVICE WORKING WITH SERIAL TO ETHERNET DEVICE SERVERS? 150
7. WHY DOES THE 7188E/8000E/PDS-700/DS-700 MODULE FAIL ON A (PUBLIC) INTERNET CONNECTION? 152
8. CAN I USE THE SETCOMMSTATE ( ) API TO CHANGES THE BAUD RATE/DATA FORMAT SETTINGS OF A VIRTUAL COM PORT? 154
9. HOW MANY PCS CAN BE CONNECTED TO A SINGLE 7188E/8000E/PDS-700/DS-700 DEVICE? 154
10. CAN I SEARCH OR CONNECT TO PDS-700/DS-700 WHEN MY PC'S IP ADDRESS IS NOT IN THE IP FILTER LIST OF PDS-700/DS-700? HOW CAN I SOLVE IT? 156

Packing List

The package includes the following items:

- One PDS-700/DS-700 series hardware module
- One printed quick start guide
- One software utility CD
- One download cable, CA-0910 (only for PDS-700 module)

Note:

If any of these items are missed or damaged, contact the local distributors for more information. Save the shipping materials and cartons in case you want to ship in the future.

More Information:

Documentations

CD:\NAPDOS\PDS\PDS-700\Readme.htm
CD:\NAPDOS\PDS\PDS-700\Document\Readme.htm

VxComm Driver (Virtual COM)

CD:\NAPDOS\7188e\TCP\VxComm\driver(pc)

Firmware

CD:\NAPDOS\PDS\PDS-700\VxComm\Server(PDS)

MiniOS7

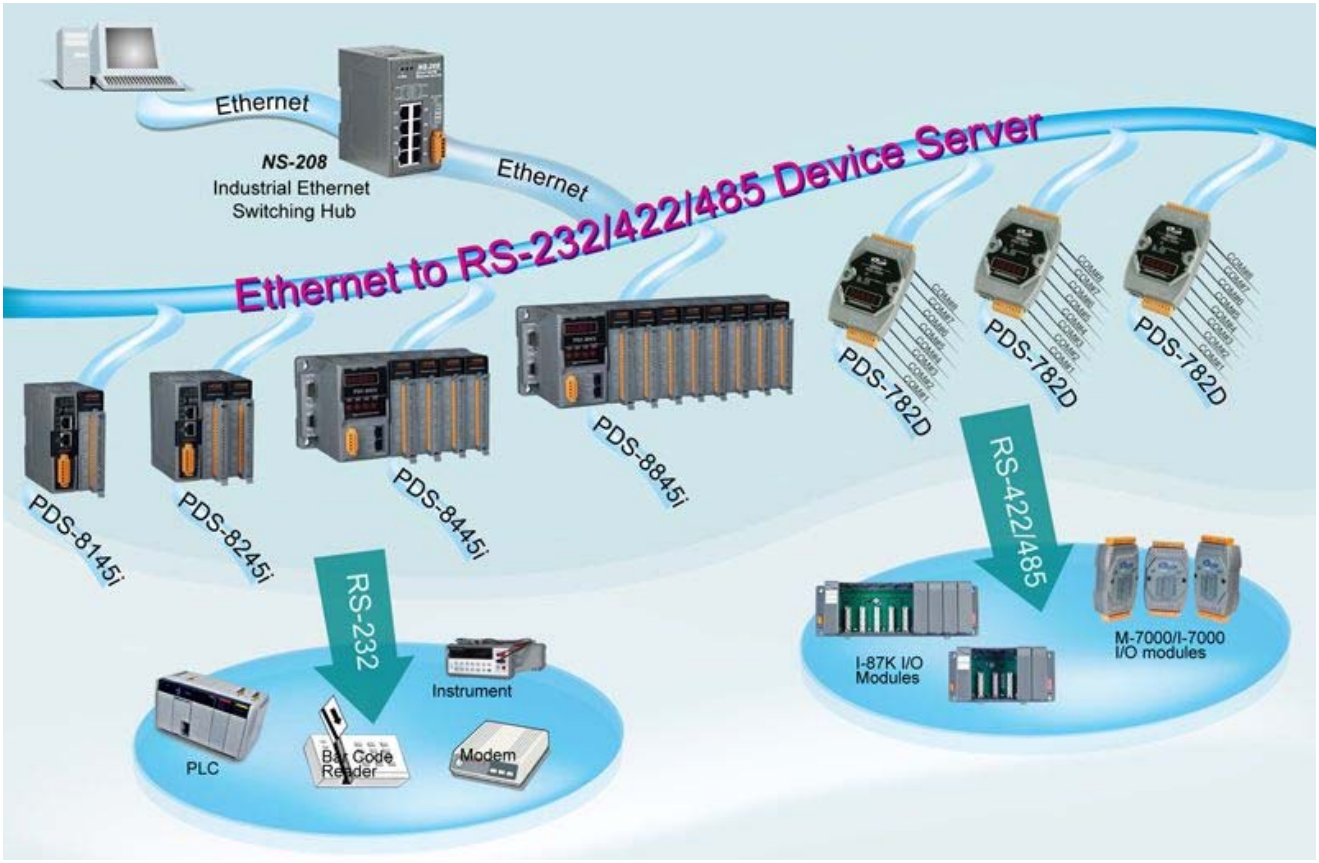
CD:\NAPDOS\PDS\PDS-700\OS_image

1. Introduction

PDS-700 is a series of **Programmable Serial-to-Ethernet Device Servers** while DS-700 is non-programmable version. They designed to meet the most common requirements of Internet/Ethernet applications, and enables users to remotely control your serial devices through an Ethernet network. PDS-700 comes with a powerful and reliable **Xserver** programming structure that allows you to quickly design robust Ethernet applications.

1.1. Why Ethernet Solutions?

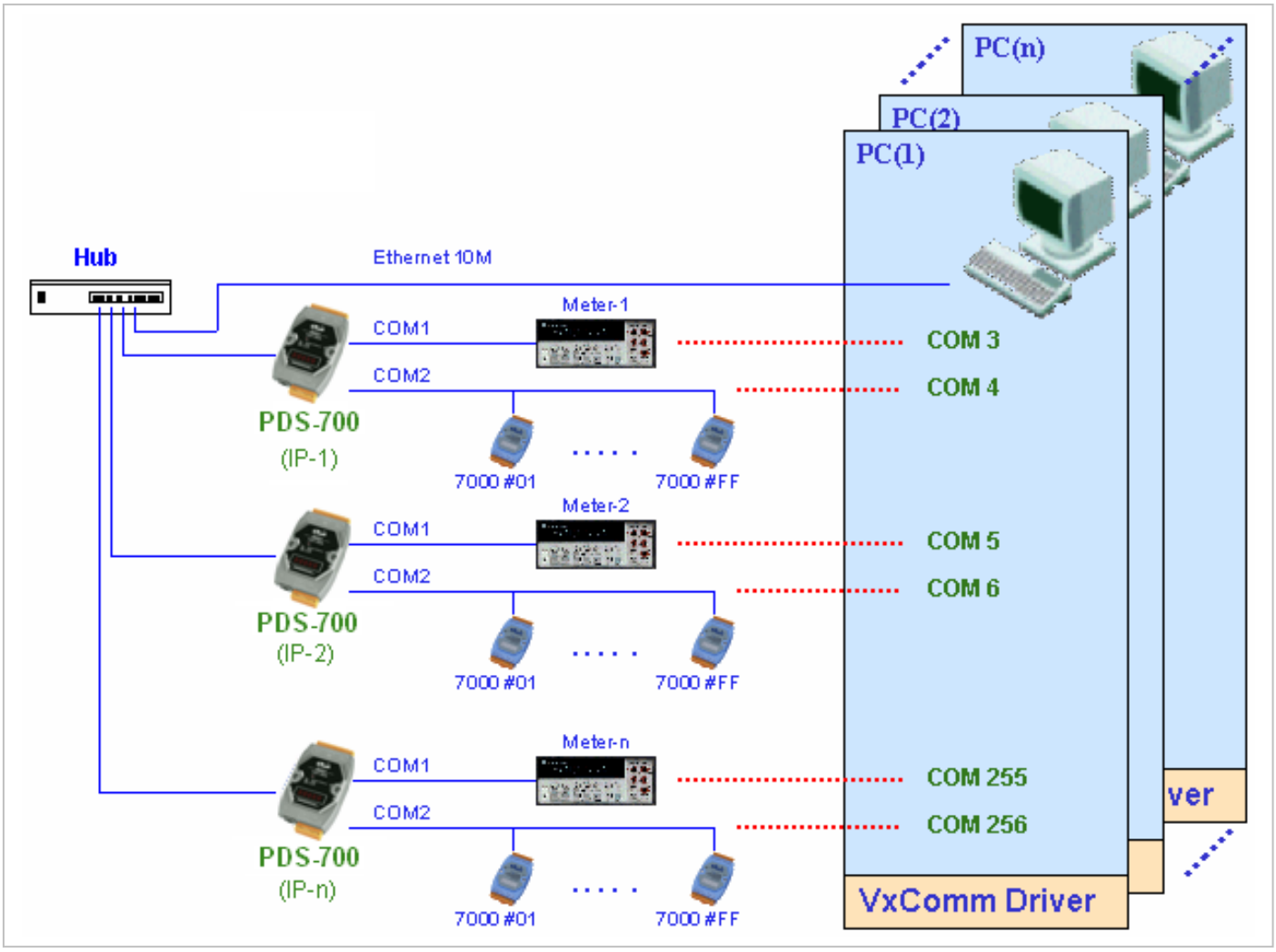
Nowadays, the Ethernet protocol has become the de-facto standard for local area networks. Via the Internet, connectivity is occurring everywhere, from home appliances, to vending machines, to testing equipment, to UPS ...etc. An Ethernet network can link office automation and industrial control networks, access remote systems and share data and information between multivendor machines; it also provides a cost-effective solution for industrial control networks.



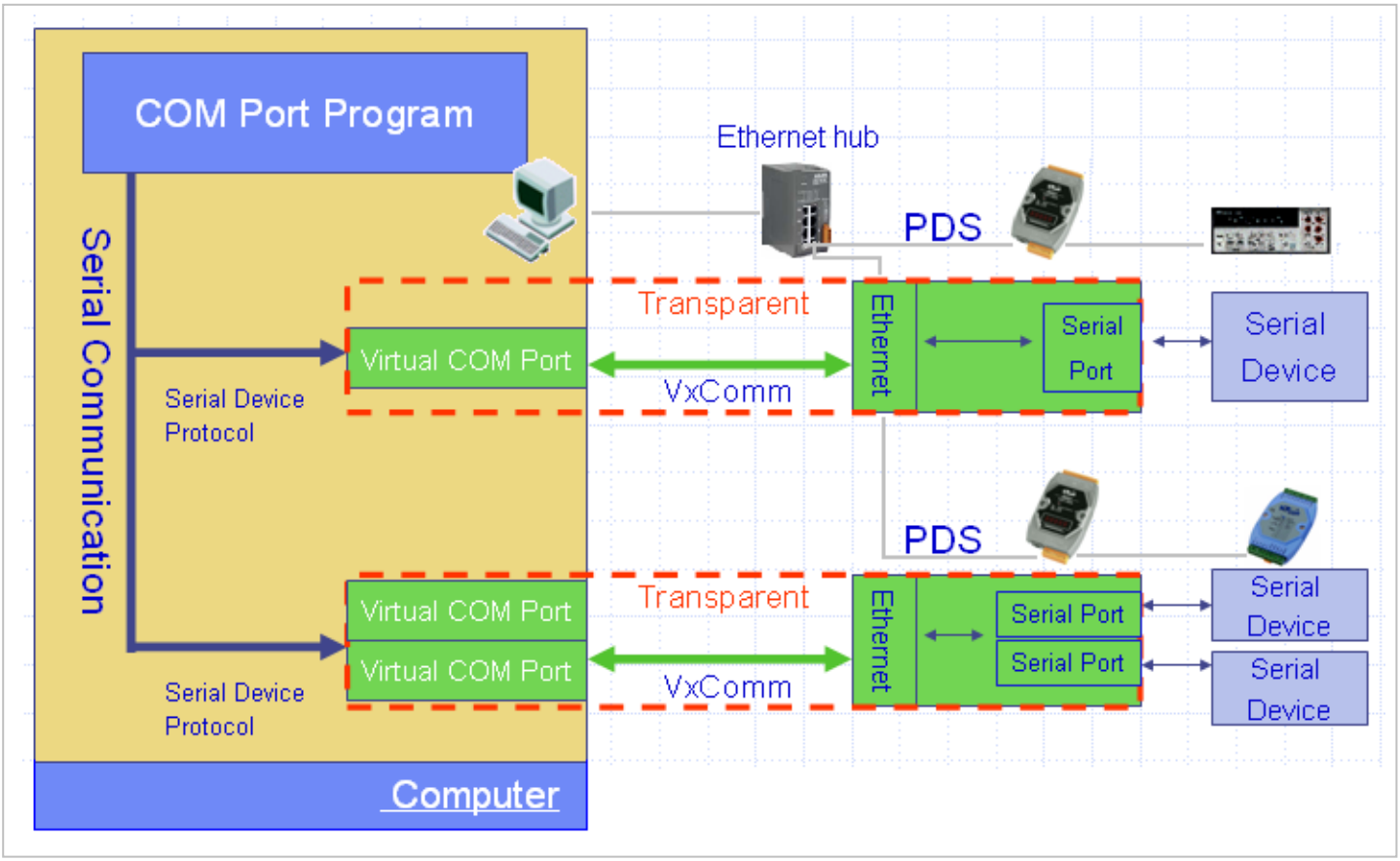
1.2. Why VxComm Technology?

In general, writing a TCP/IP program is more difficult than a COM port program, or the COM port communication system was built many years ago.

As a result, a new technology, **VxComm** was developed to **virtualize the COM ports of the PDS-700/DS-700 to allow up to 256 COM Ports to be used on the central computer.** The VxComm driver saves time when accessing serial devices through the Ethernet without the need for reprogramming the COM port software on the PC.

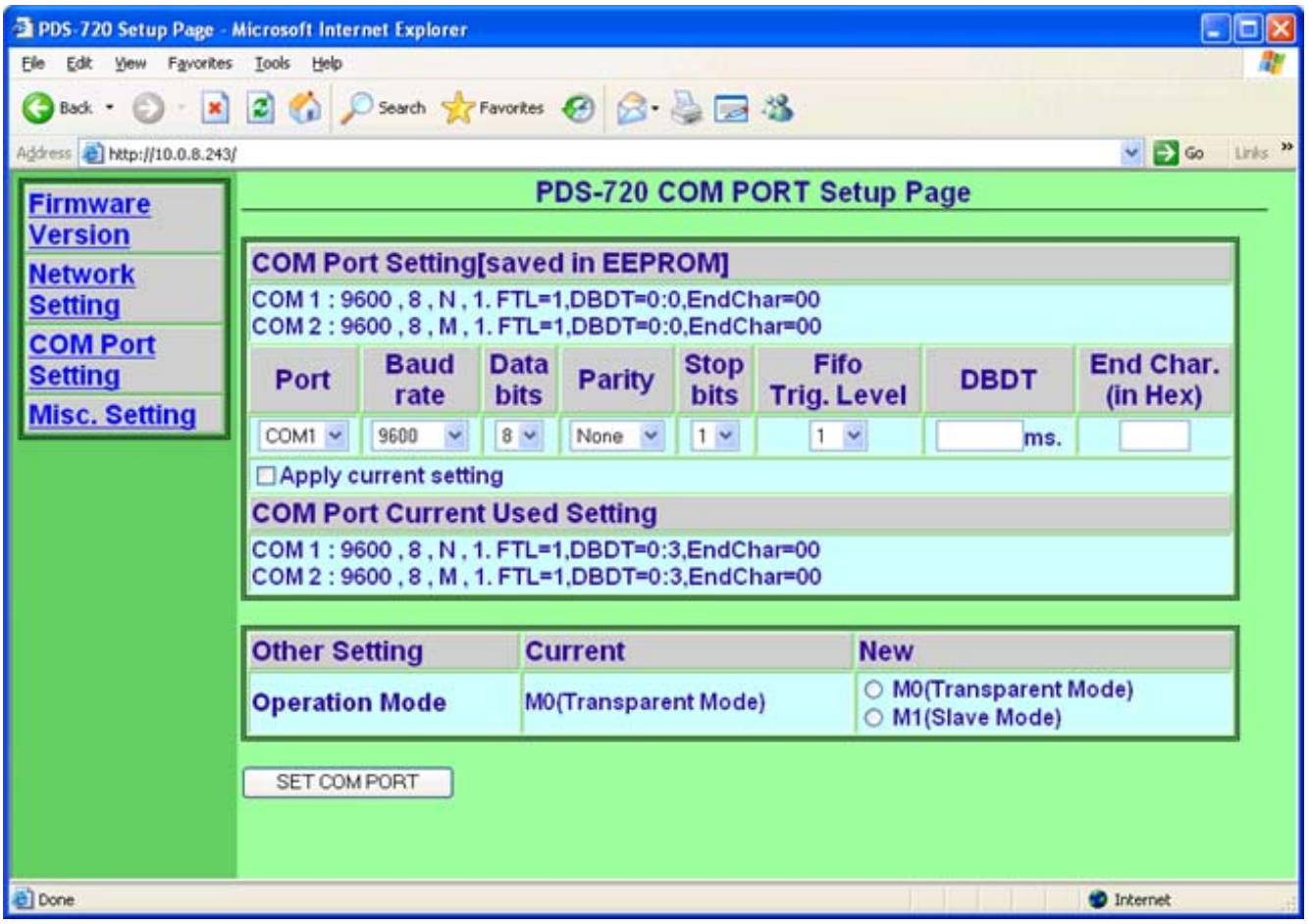


The VxComm driver controls all the details of the Ethernet TCP/IP programming technique; your COM port program will be able to access your serial devices through Ethernet in the same way as through COM port with the assistance of PDS-700/DS-700 and VxComm technology.



1.3. Why Web Server Technology?

Web server technology enables configuration of the PDS-700/DS-700 via a standard web browser interface, e.g. Internet Explorer, FireFox or Mozilla, etc. This means that it is easy to check the configuration of the PDS-700/DS-700 via an Ethernet network without needing to install any other software tools; thereby reducing the user's learning carve.

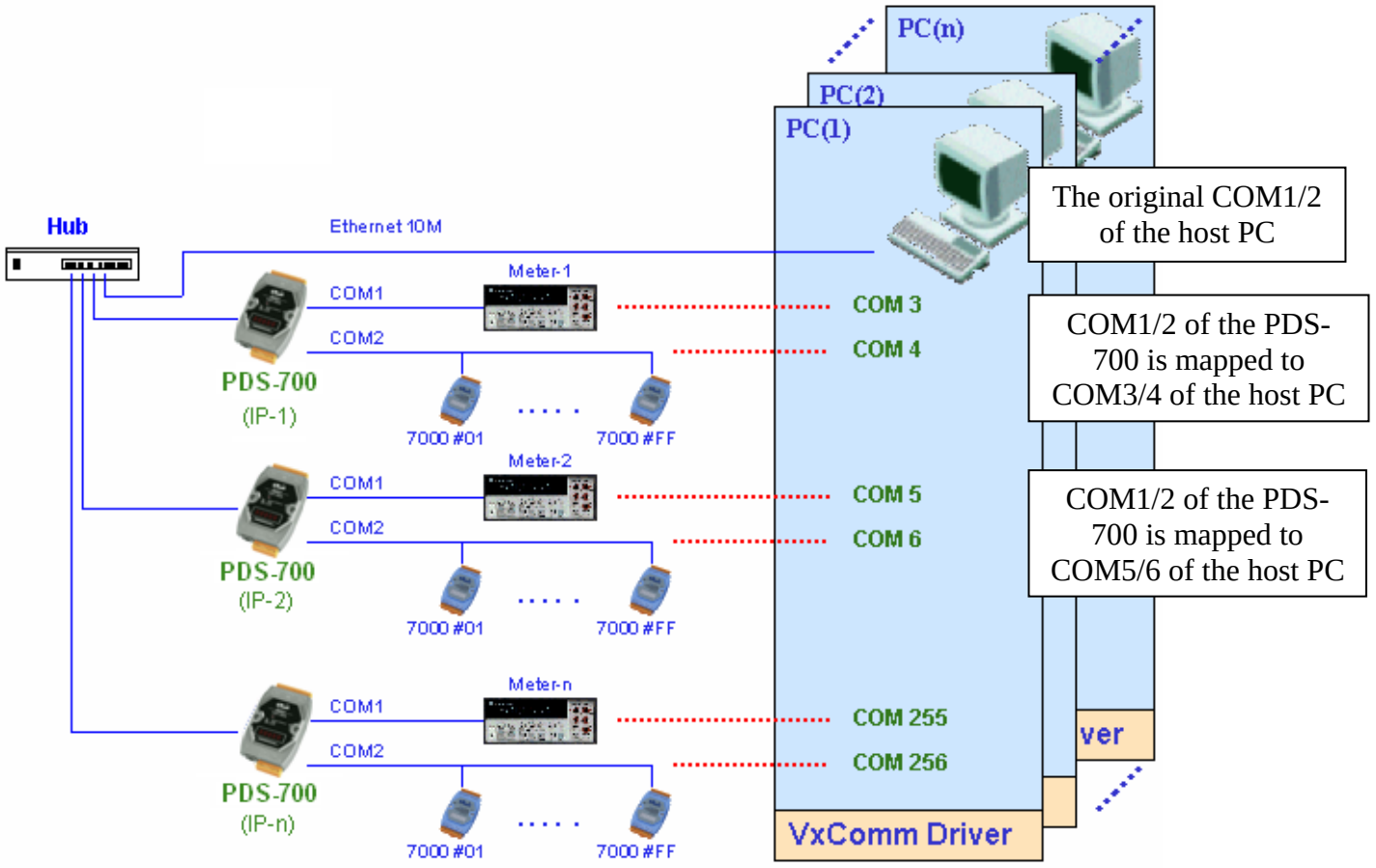


2.Typical Applications for the PDS-700/DS-700

2.1. RS-232/485/422 Device Networking

--- Using Virtual COM Technology ---

The PDS-700/DS-700 series is designed to link RS-232/485/422 devices to an Ethernet network. The VxComm utility allows the built-in PDS-700/DS-700 COM Port to be virtualized to a standard COM Port of the host PC as shown below:



In the configuration above, Meter-1 is virtualized to link to COM3 of the host PC. Therefore a program original designed for the MS-COMM standard can access the meter **without any modification.**

2.2. Ethernet I/O Applications

The PDS series provides 2 types of Ethernet I/O solutions:

1. Linking to I-7000 series modules
2. Built-in DIO (if the module supports the DIO function)

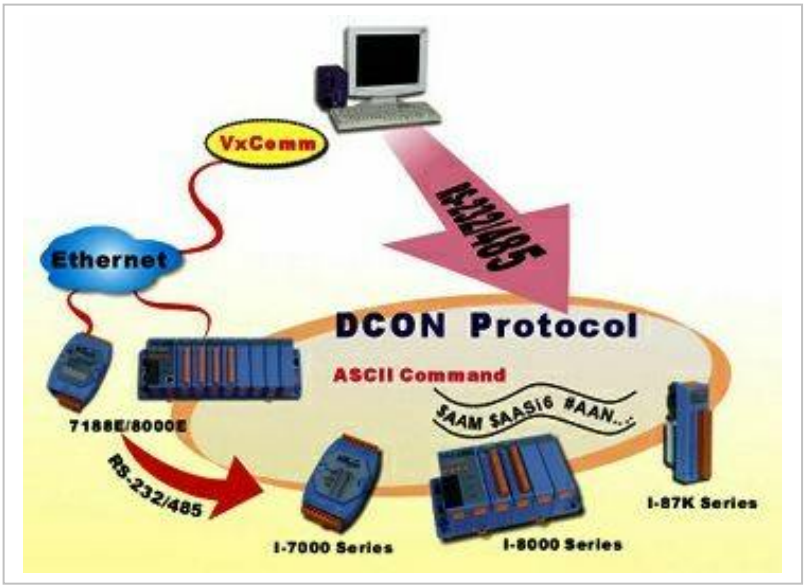
Linking to I-7000 series modules

The I-7000 series provides a variety of I/O operations, such as D/I, D/O, A/D, D/A, Counter and Frequency Measurement, etc. The I-7000 series was originally designed to be used with RS-485 networks, so COM2 on the PDS-700 can be used to link to I-7000 series modules.

By using VxComm technology, programs that on the host PC support serial devices can be upgraded from a RS-485 network to an Ethernet network without requiring any modifications to the program. Refer to Sec. 2.1 for more information.

Built-in DIO

The DCON protocol is a request /reply communication. Protocol that is defined using a simple ASCII format, such as $AAN, $AASi6, #AAN, etc. and is used to access PDS-700/DS-700 and I-7000/8000/ 87k series I/O modules.



The DCON protocol command set for the PDS-700/DS-700 is introduced in Sec. 7. The protocol allows access the built-in I/O through the virtual COM Ports mapped to the Port I/O of the PDS-700/DS-700 in the VxComm Utility.

2.3. Linking I-7000 Series Modules to an Ethernet Network

The I-7000 family was originally designed for use with an RS-485 network. They are very robust and work well under the harsh industrial environments.

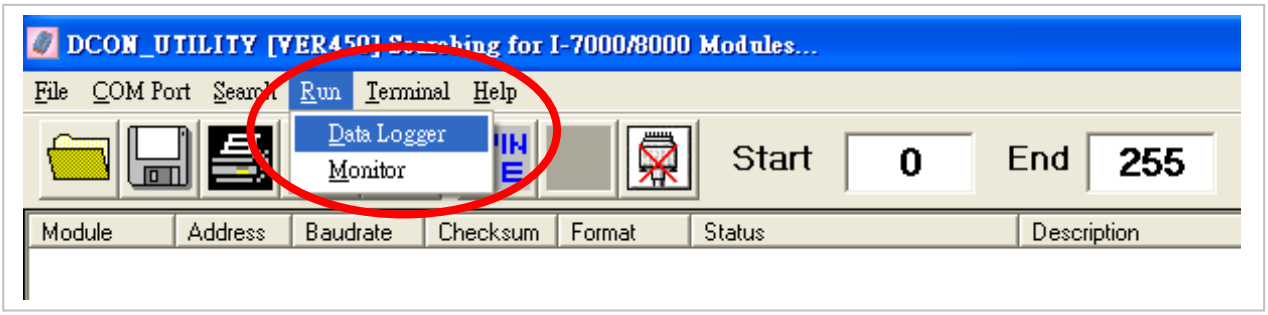
The PDS-700/DS-700 enables I-7000 modules to be upgraded to an Ethernet solution. Linking I-7000 modules to an Ethernet combines the advantages of both RS-485 and Ethernet solutions and expands RS-485 applications to the whole world.

The VxComm approach provides an MS-COMM-compatible interface. Therefore, previously developed programs should still function without the need for any modifications.

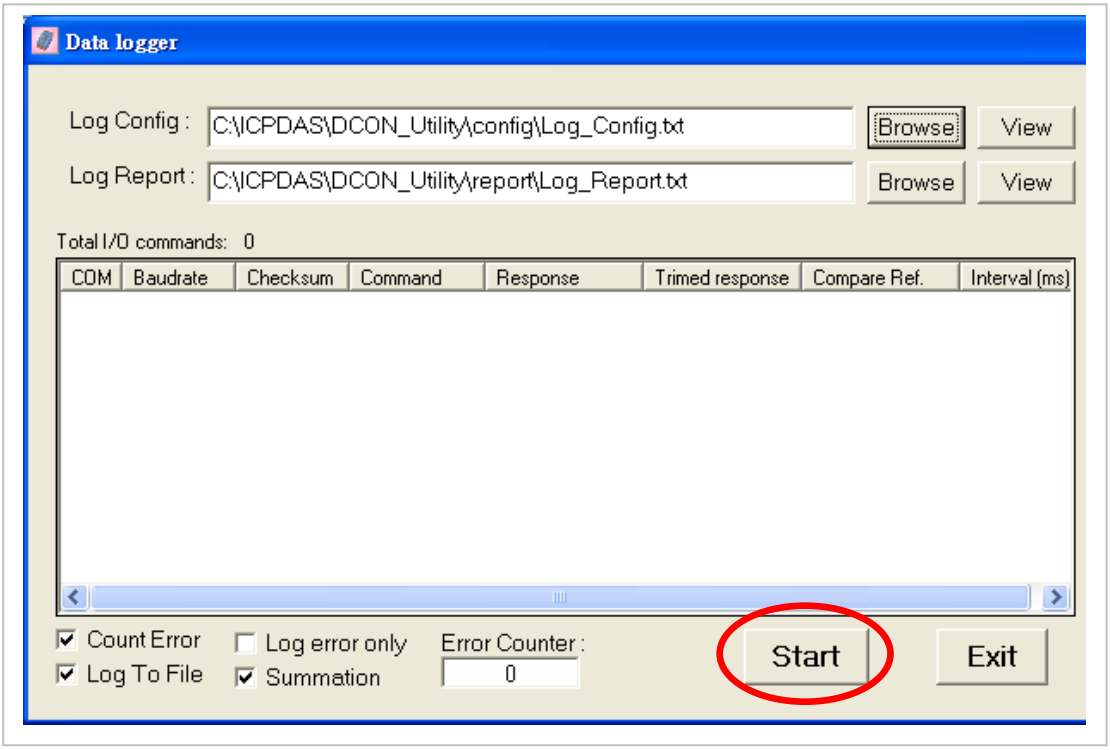
2.4. Configurable Ethernet Data Logger

Using the VxComm driver, PDS-700/DS-700 + 7000 modules can be virtualized to become COM Port + 7000 modules located on the host-PC, and then the Data Logger in the DCON Utility can be used to access data of I-7000 from the Ethernet. Signal data originating from the I-7000 modules can be analyzed using MS-Excel without the need to write any custom programs

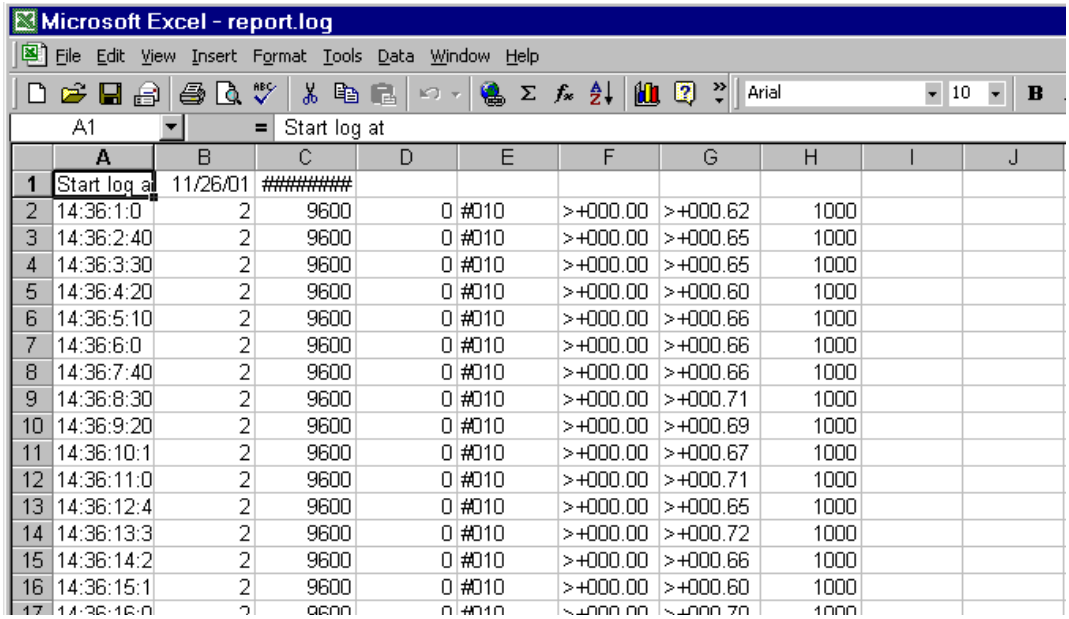
1: The DCON utility includes a log function, as show below:



2: Configure the system connection as shown below and click the “Start” button to begin logging data.

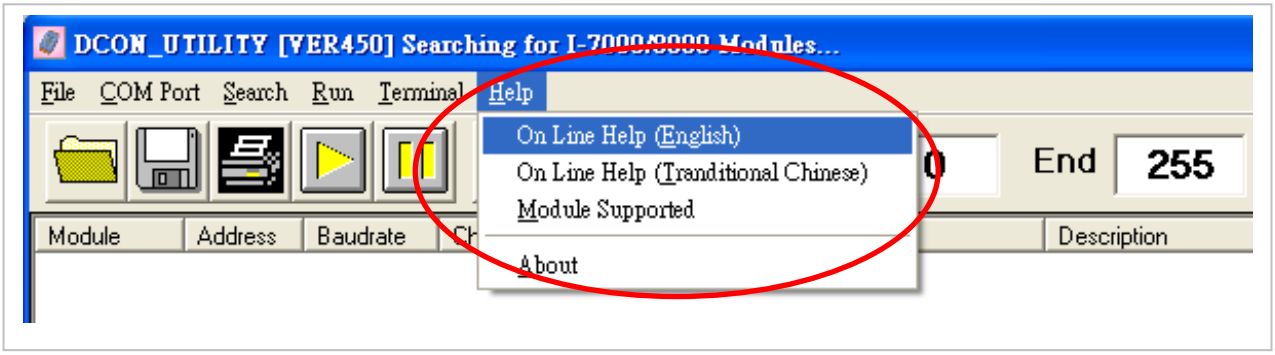


3: Open the log file in Excel to read the log data as shown in the example below:



	A	B	C	D	E	F	G	H	I	J
1	Start log at	11/26/01	#########							
2	14:36:1:0	2	9600	0	#010	>+000.00	>+000.62	1000		
3	14:36:2:40	2	9600	0	#010	>+000.00	>+000.65	1000		
4	14:36:3:30	2	9600	0	#010	>+000.00	>+000.65	1000		
5	14:36:4:20	2	9600	0	#010	>+000.00	>+000.60	1000		
6	14:36:5:10	2	9600	0	#010	>+000.00	>+000.66	1000		
7	14:36:6:0	2	9600	0	#010	>+000.00	>+000.66	1000		
8	14:36:7:40	2	9600	0	#010	>+000.00	>+000.66	1000		
9	14:36:8:30	2	9600	0	#010	>+000.00	>+000.71	1000		
10	14:36:9:20	2	9600	0	#010	>+000.00	>+000.69	1000		
11	14:36:10:1	2	9600	0	#010	>+000.00	>+000.67	1000		
12	14:36:11:0	2	9600	0	#010	>+000.00	>+000.71	1000		
13	14:36:12:4	2	9600	0	#010	>+000.00	>+000.65	1000		
14	14:36:13:3	2	9600	0	#010	>+000.00	>+000.72	1000		
15	14:36:14:2	2	9600	0	#010	>+000.00	>+000.66	1000		
16	14:36:15:1	2	9600	0	#010	>+000.00	>+000.60	1000		

By using the I-7000 DCON utility and MS Excel in conjunction with the **VxComm technology**, the signal data of I-7000 modules from the Ethernet network can be analyzed without the need to write custom programs. For more information about the **log function** refer to the online help feature (English and Traditional Chinese) of the DCON utility.



3. Hardware information

3.1. Features

- CPU: 80186 - 80 MHz
- SRAM: 512 K bytes
- Flash ROM: 512 K bytes
- Built-in EEPROM (16 KB)
- Built-in COM Port: PDS-700: COM1 = RS-232, COM2 = RS-485
  DS-712: COM1 = RS-232
  DS-715: COM1 = RS-485/RS-422
- Built-in Watchdog timer for harsh environments
- Built-in power protection circuit
- Built-in RS-485 network protection circuit for the RS-485 Port
- Built-in self-tuning ASIC controller on the RS-485 Port
- PDS-700: Programs download able from a PC
- Built-in 5-digit LED display interface (only for display versions)
- Ethernet Port: 10/100 Base-TX
- Built-in OS: ICP DAS MiniOS7
- ODM wanted

3.2. Specifications

System

- Module Name: PDS-700/DS-700 series
- CPU: 80186-80 MHz
- SRAM: 512 K bytes
- FLASH ROM: 512 K bytes, erase unit is one sector (64 K bytes); 100,000 erase/write cycles.
- COM Ports: PDS-700: COM1 = RS-232, COM2 = RS-485
  DS-712: COM1 = RS-232
  DS-715: COM1 = RS-485/RS-422
- PDS-700: Programs download via COM1

EEPROM

- 16 K bytes
- Data Retention: 40 years
- 1,000,000 erase/write cycles

Flash Memory

- 512 K bytes
- Erase unit is one sector (64 K bytes)
- 100,000 erase/write cycles

PDS-700: COM1

- RS-232: TXD, RXD, RTS, CTS, GND; Non-isolation
- Communication Speed: 115200 bps max.
- Program download port

PDS-700: COM2

- RS-485: Data+, Data-, self-tuner internal ASIC; Non-isolation
- Communication Speed: 115200 bps max.

DS-712: COM1

- RS-232: TXD, RXD, RTS, CTS, GND; Non-isolation
- Communication Speed: 115200 bps max.

DS-715: COM1

- RS-422(TXD+, TXD-, RXD+, RXD-)/RS-485(D2+,D2-), Isolation
- Communication Speed: 115200 bps max.

Display

- 7-segment LED: 5-digit (for display versions)

Ethernet

- 10/100 Base-TX
- Auto-negotiating, auto MDI/MDIX, LED indicator

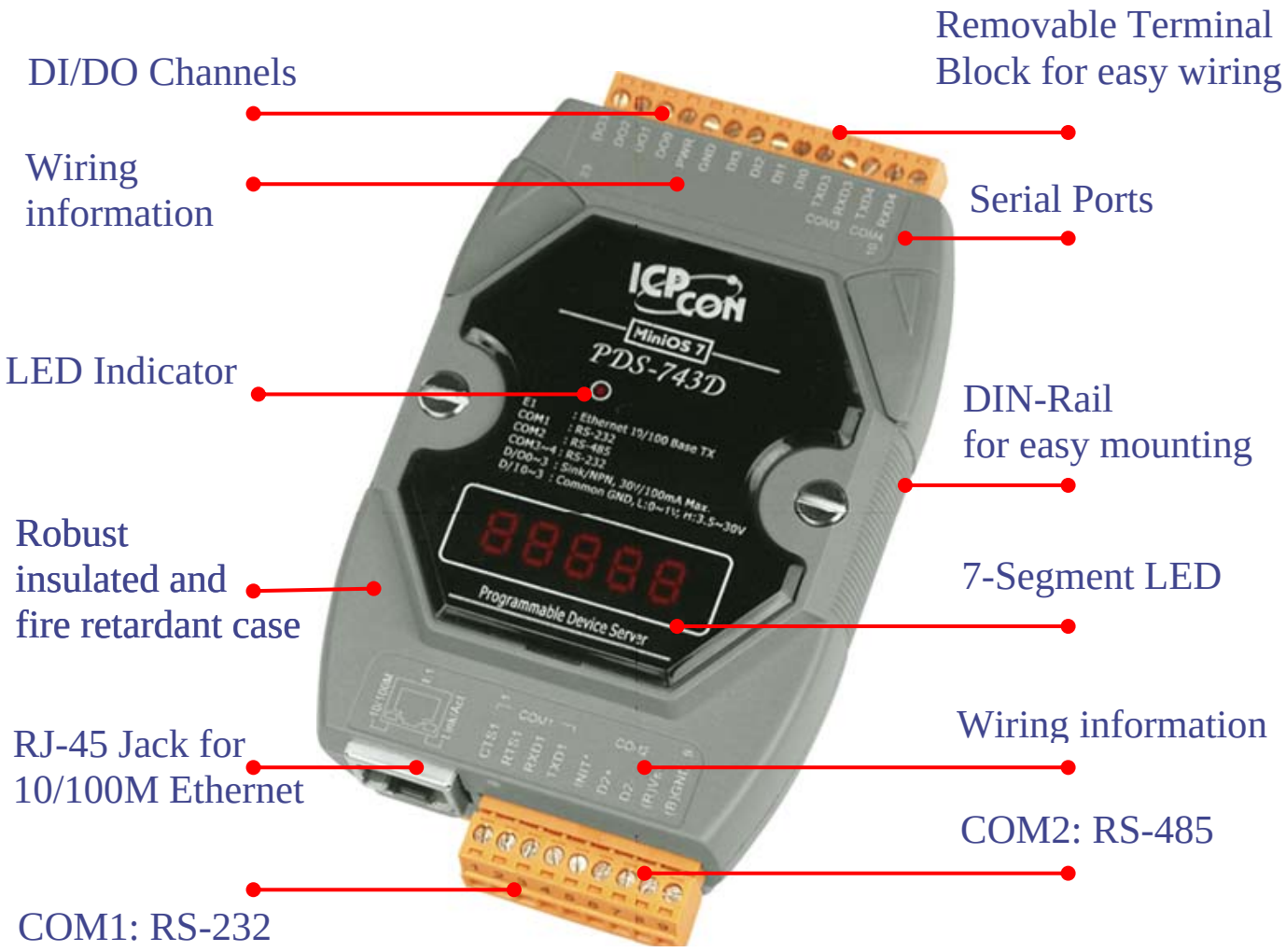
Power

- Power Requirements: 10 ~ 30 V_{DC} (non-regulated) (for PDS-700)
  12 ~ 48 V_{DC} (non-regulated) (for DS-700/PDS-742-IP67/ PDS-782-25)
- Power Consumption: 2.0 W for the PDS-700/DS-700 series
  2.7 W for the PDS-700D series

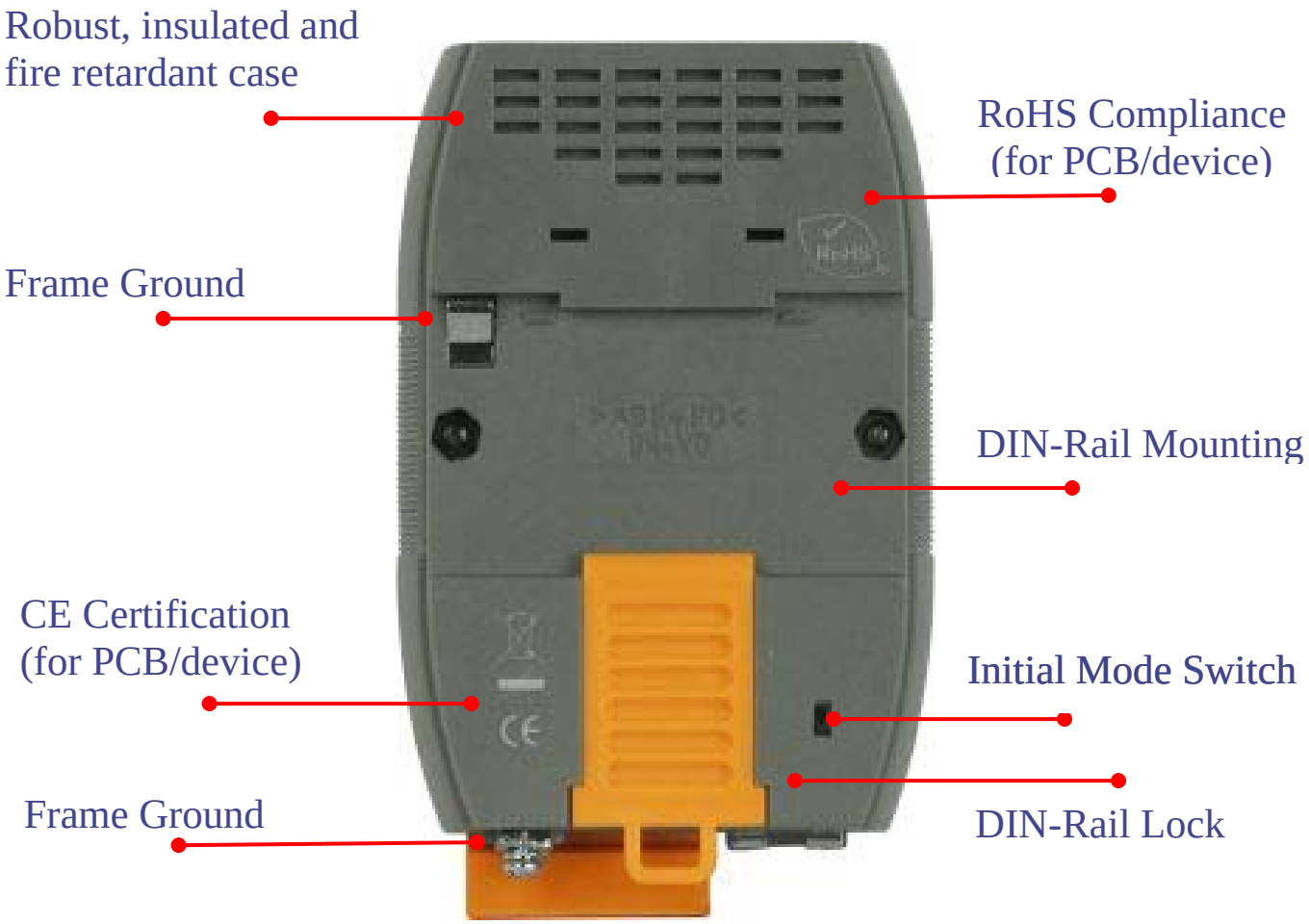
DI/O:

- D/I: 3.5 V ~ 30 V max.
- D/O: 100 mA, 30 V max.

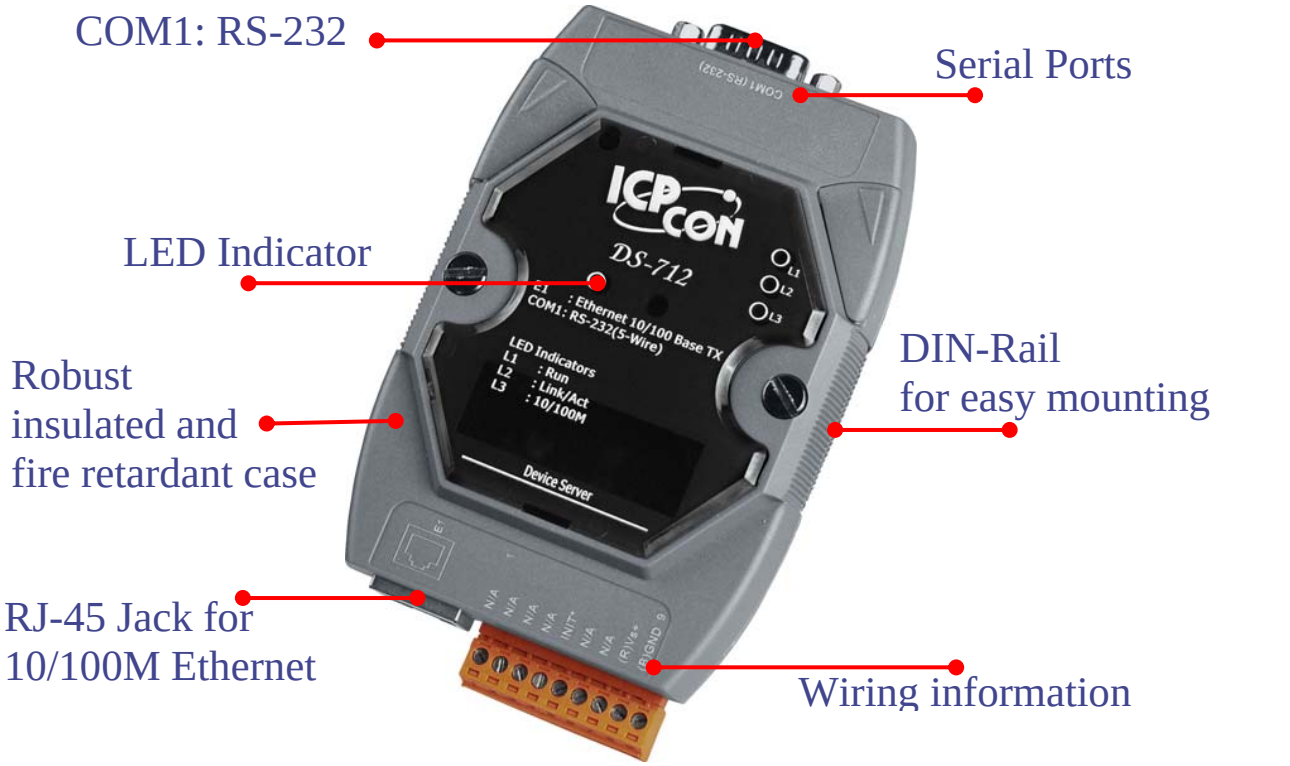
PDS-700 Front View

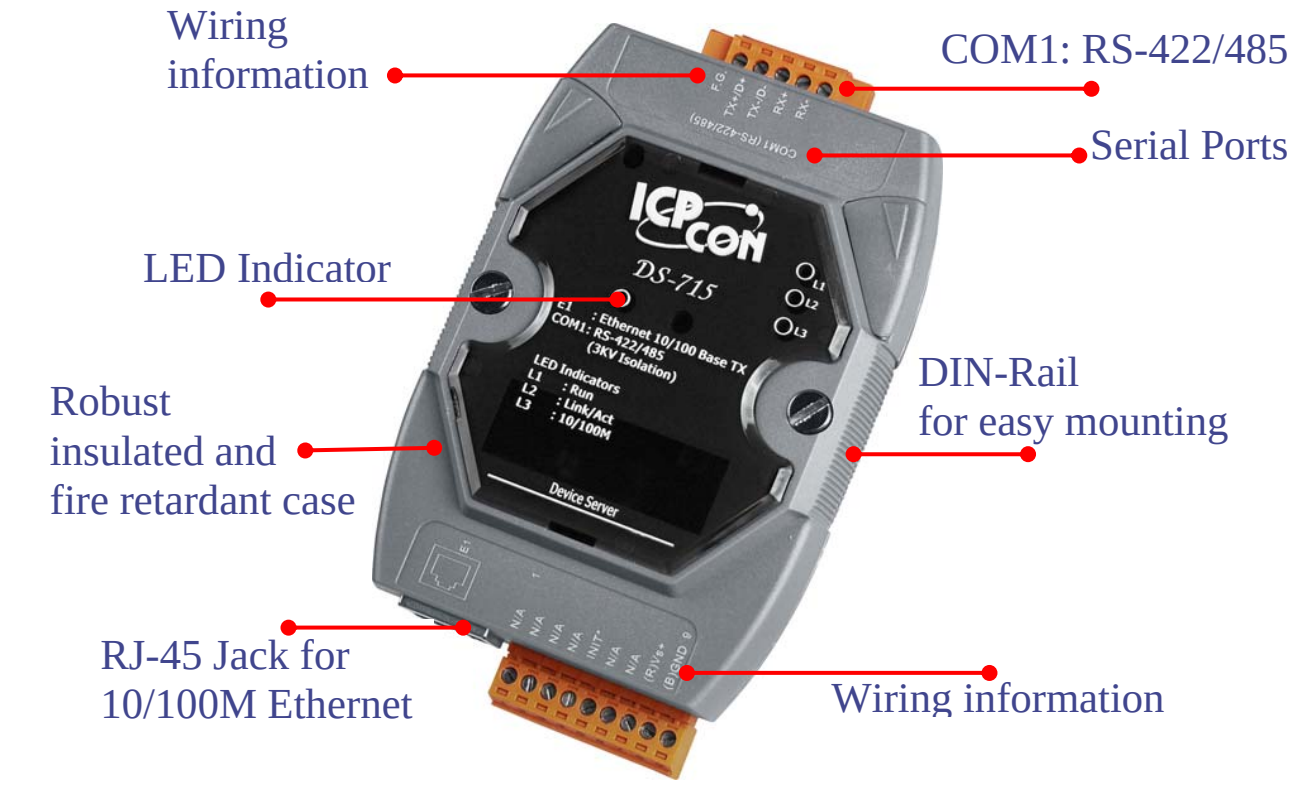


PDS-700 Rear ViewP



DS-700 Front View





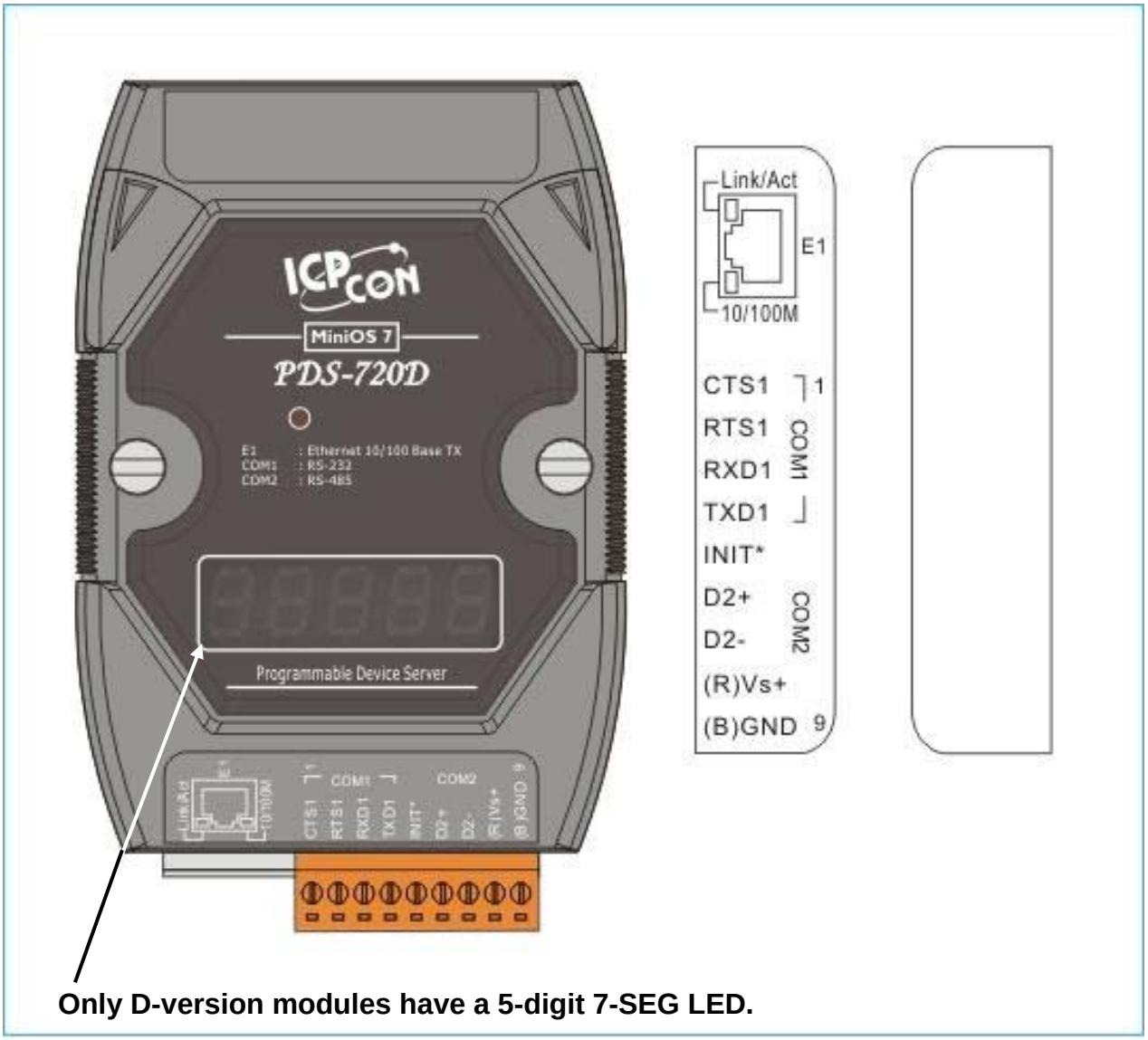
3.3. PDS-700/DS-700 Selection Guide

Model	DI/DO	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8
DS-712	-	5-wire RS-**232**	-	-	-	-	-	-	-
DS-715	-	2-wire RS-**485** 4-wire RS-**422**	-	-	-	-	-	-	-
PDS-720 PDS-720D	-	5-wire RS-**232**	2-wire RS-**485**	-	-	-	-	-	-
PDS-721 PDS-721D	6/7	5-wire RS-**232**	2-wire RS-**485**	-	-	-	-	-	-
PDS-732 PDS-732D	4/4	5-wire RS-**232**	2-wire RS-**485**	5-wire RS-**232**	-	-	-	-	-
PDS-734 PDS-734D	4/4	5-wire RS-**232**	2-wire RS-**485**	4-wire RS-**422**	-	-	-	-	-
PDS-742 PDS-742D	-	5-wire RS-**232**	2-wire RS-**485**	5-wire RS-**232**	9-wire RS-**232**	-	-	-	-
PDS-742-IP67	-	5-wire RS-**232**	2-wire RS-**485**	5-wire RS-**232**	5-wire RS-**232**				
PDS-743 PDS-743D	4/4	5-wire RS-**232**	2-wire RS-**485**	3-wire RS-**232**	3-wire RS-**232**	-	-	-	-
PDS-752 PDS-552D	-	5-wire RS-**232**	2-wire RS-**485**	5-wire RS-**232**	5-wire RS-**232**	5-wire RS-**232**	-	-	-
PDS-755 PDS-755D	-	5-wire RS-**232**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	-	-	-
PDS-762 PDS-762D	1/2	5-wire RS-**232**	2-wire RS-**485**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	-	-
PDS-775-A PDS-775D-A	-	RS-**232** /RS-**485**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	2-wire RS-**485**	-
PDS-782 PDS-782D	-	5-wire RS-**232**	2-wire RS-**485**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**
PDS-782-25 PDS-782D-25		5-wire RS-**232**	2-wire RS-**485**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**	3-wire RS-**232**

2-wire RS-485 : Data+, Data- with Self-Tuner inside
4-wire RS-422 : TxD+, TxD-, RxD+, RxD-
3-wire RS-232 : RxD, TxD, GND
5-wire RS-232 : RxD, TxD, CTS, RTS, GND
8-wire RS-232 : RxD, TxD, CTS, RTS, DSR, DTR, DCD, GND
9-wire RS-232 : RxD, TxD, CTS, RTS, DSR, DTR, DCD, RI, GND

3.4. Pin Assignments

Pin Assignments for PDS-720/720D models



Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ Pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND Pin for the power supply (COM1 GND)

E1: 10/100 Base-TX

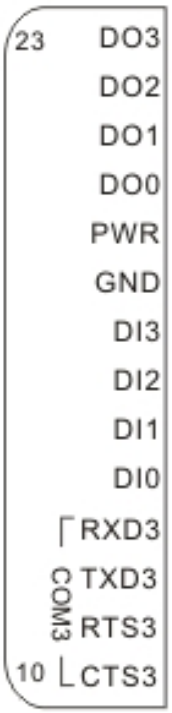
PDS-721/721D Pin Assignments

Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ Pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND Pin for the power supply (COM1 GND)
10	DO6	Digital Output channel 6, 100 mA, 30 V max.
11	DO5	Digital Output channel 5, 100 mA, 30 V max.
12	DO4	Digital Output channel 4, 100 mA, 30 V max.
13	DO3	Digital Output channel 3, 100 mA, 30 V max.
14	DO2	Digital Output channel 2, 100 mA, 30 V max.
15	DO1	Digital Output channel 1, 100 mA, 30 V max.
16	DO0	Digital Output channel 0, 100 mA, 30 V max.
17	PWR	Power Input for Digital Output
18	DI5	Digital Input channel 5, 3.5 V ~ 30 V
19	DI4	Digital Input channel 4, 3.5 V ~ 30 V
20	DI3	Digital Input channel 3, 3.5 V ~ 30 V
21	DI2	Digital Input channel 2, 3.5 V ~ 30 V
22	DI1	Digital Input channel 1, 3.5 V ~ 30 V
23	DI0	Digital Input channel 0, 3.5 V ~ 30 V

E1: 10/100 Base-TX

PDS-732/732D Pin Assignments



Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	CTS3	COM3 CTS pin (RS-232)
11	RTS3	COM3 RTS pin (RS-232)
12	TXD3	COM3 TXD pin (RS-232)
13	RXD3	COM3 RXD pin (RS-232)
14	DI0	Digital Input channel 0, 3.5 V ~ 30 V
15	DI1	Digital Input channel 1, 3.5 V ~ 30 V
16	DI2	Digital Input channel 2, 3.5 V ~ 30 V
17	DI3	Digital Input channel 3, 3.5 V ~ 30 V
18	GND	GND pin for the Digital Output (COM3 GND)
19	PWR	Power Input for Digital Output
20	DO0	Digital Output channel 0, 100 mA, 30 V max.
21	DO1	Digital Output channel 1, 100 mA, 30 V max.
22	DO2	Digital Output channel 2, 100 mA, 30 V max.
23	DO3	Digital Output channel 3, 100 mA, 30 V max.

E1: 10/100 Base-TX

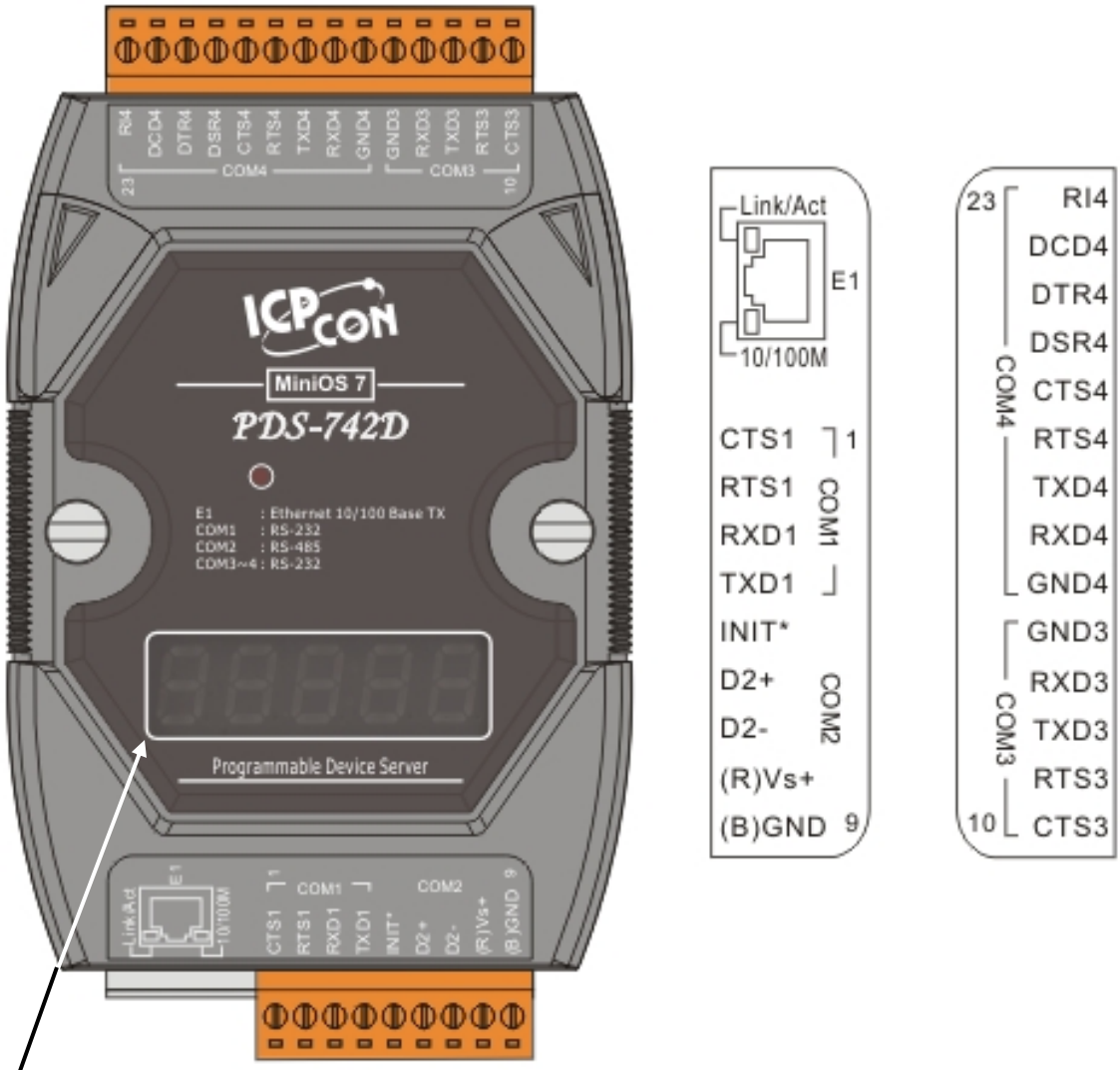
PDS-734/734D Pin Assignments

Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	TXD3+	COM3 TXD+ pin (RS-422/RS-485)
11	TXD3-	COM3 TXD- pin (RS-422/RS-485)
12	RXD3+	COM3 RXD+ pin (RS-422)
13	RXD3-	COM3 RXD- pin (RS-422)
14	DI0	Digital Input channel 0, 3.5 V ~ 30 V
15	DI1	Digital Input channel 1, 3.5 V ~ 30 V
16	DI2	Digital Input channel 2, 3.5 V ~ 30 V
17	DI3	Digital Input channel 3, 3.5 V ~ 30 V
18	GND	GND pin for the Digital Output
19	PWR	Power Input for Digital Output
20	DO0	Digital Output channel 0, 100 mA, 30 V max.
21	DO1	Digital Output channel 1, 100 mA, 30 V max.
22	DO2	Digital Output channel 2, 100 mA, 30 V max.
23	DO3	Digital Output channel 3, 100 mA, 30 V max.

E1: 10/100 Base-TX

PDS-742/742D Pin Assignments

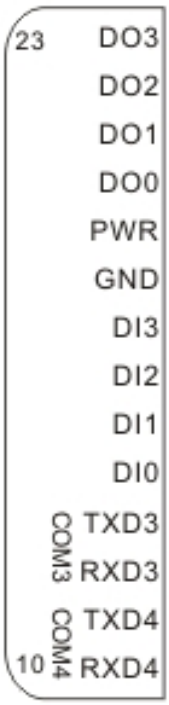


Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	CTS3	COM3 CTS pin (RS-232)
11	RTS3	COM3 RTS pin (RS-232)
12	TXD3	COM3 TXD pin (RS-232)
13	RXD3	COM3 RXD pin (RS-232)
14	GND3	COM3 GND pin (RS-232)
15	GND4	COM4 GND pin (RS-232)
16	RXD4	COM4 RXD pin (RS-232)
17	TXD4	COM4 TXD pin (RS-232)
18	RTS4	COM4 RTS pin (RS-232)
19	CTS4	COM4 CTS pin (RS-232)
20	DSR4	COM4 DSR pin (RS-232)
21	DTR4	COM4 DTR pin (RS-232)
22	DCD4	COM4 DCD pin (RS-232)
23	RI4	COM4 RI pin (RS-232)

E1: 10/100 Base-TX

PDS-743/743D Pin Assignments

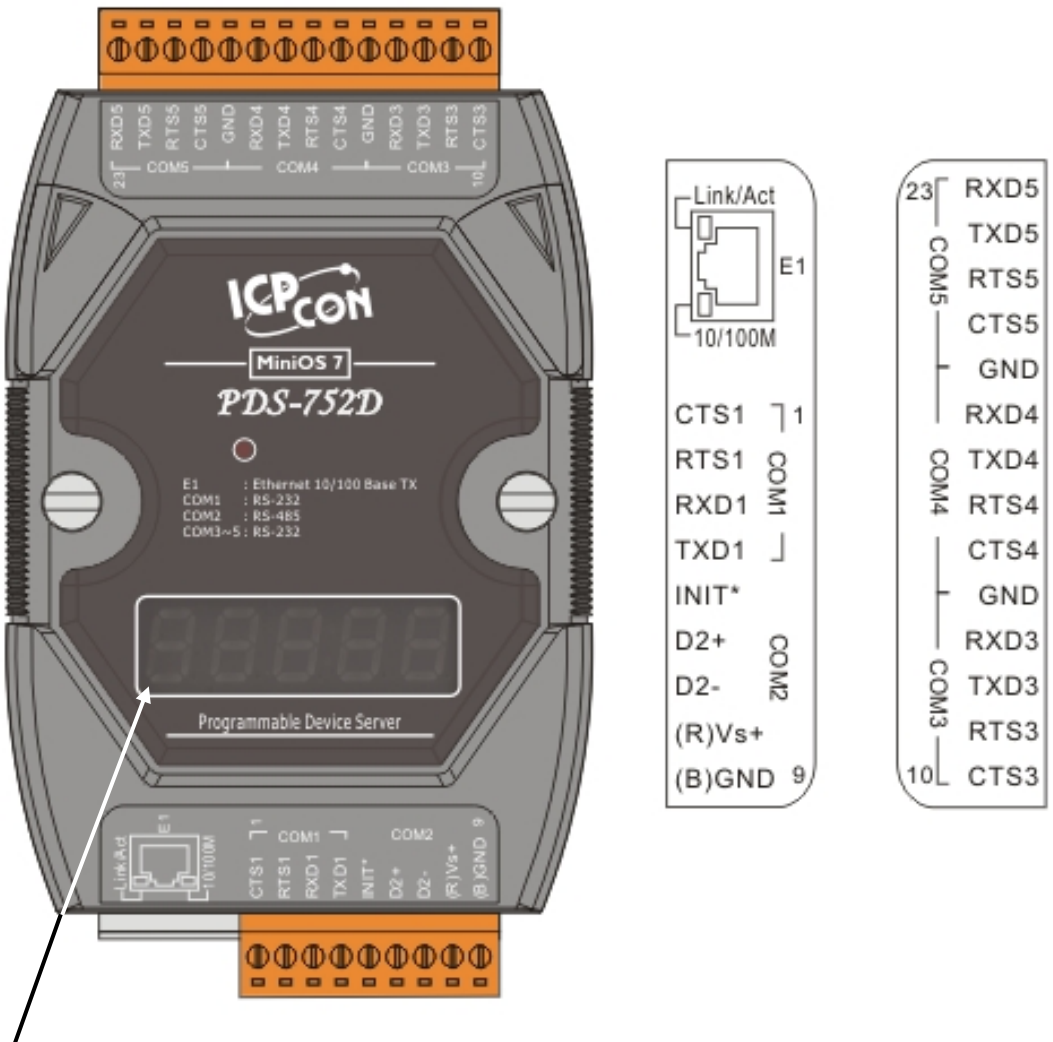


Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	RXD4	COM4 RXD pin (RS-232)
11	TXD4	COM4 TXD pin (RS-232)
12	RXD3	COM3 RXD pin (RS-232)
13	TXD3	COM3 TXD pin (RS-232)
14	DI0	Digital Input channel 0, 3.5 V ~ 30 V
15	DI1	Digital Input channel 1, 3.5 V ~ 30 V
16	DI2	Digital Input channel 2, 3.5 V ~ 30 V
17	DI3	Digital Input channel 3, 3.5 V ~ 30 V
18	GND	GND pin for the Digital Output (COM3/COM4 GND)
19	PWR	Power Input for Digital Output
20	DO0	Digital Output channel 0, 100 mA, 30 V max.
21	DO1	Digital Output channel 1, 100 mA, 30 V max.
22	DO2	Digital Output channel 2, 100 mA, 30 V max.
23	DO3	Digital Output channel 3, 100 mA, 30 V max.

E1: 10/100 Base-TX

PDS-752/752D Pin Assignments

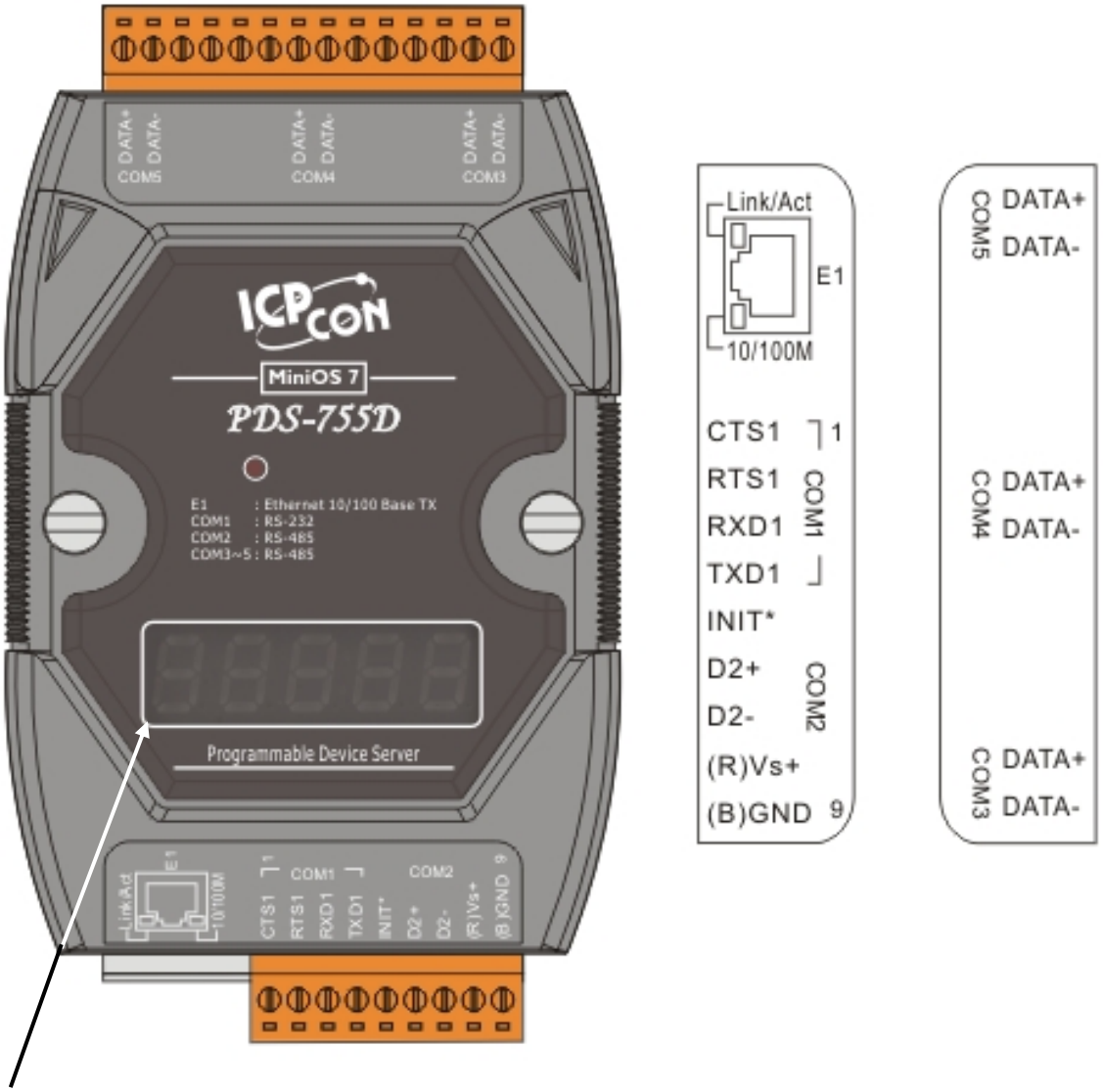


Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	CTS3	COM3 CTS pin (RS-232)
11	RTS3	COM3 RTS pin (RS-232)
12	TXD3	COM3 TXD pin (RS-232)
13	RXD3	COM3 RXD pin (RS-232)
14	GND	COM3/COM4 GND pin (RS-232)
15	CTS4	COM4 CTS pin (RS-232)
16	RTS4	COM4 RTS pin (RS-232)
17	TXD4	COM4 TXD pin (RS-232)
18	RXD4	COM4 RXD pin (RS-232)
19	GND	COM4/COM5 GND pin (RS-232)
20	CTS5	COM5 CTS pin (RS-232)
21	RTS5	COM5 RTS pin (RS-232)
22	TXD5	COM5 TXD pin (RS-232)
23	RXD5	COM5 RXD pin (RS-232)

E1: 10/100 Base-TX

PDS-755/755D Pin Assignments



Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	D3-	COM3 Data- pin (RS-485)
11	D3+	COM3 Data+ pin (RS-485)
12	-	N.C.
13	-	N.C.
14	-	N.C.
15	-	N.C.
16	D4-	COM4 Data- pin (RS-485)
17	D4+	COM4 Data+ pin (RS-485)
18	-	N.C.
19	-	N.C.
20	-	N.C.
21	-	N.C.
22	D5-	COM5 Data- pin (RS-485)
23	D5+	COM5 Data+ pin (RS-485)

E1: 10/100 Base-TX

PDS-762/762D Pin Assignments

Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	RXD3	COM3 RXD pin (RS-232)
11	TXD3	COM3 TXD pin (RS-232)
12	RXD4	COM4 RXD pin (RS-232)
13	TXD4	COM4 TXD pin (RS-232)
14	GND	GND pin for COM3/COM4
15	RXD5	COM5 RXD pin (RS-232)
16	TXD5	COM5 TXD pin (RS-232)
17	RXD6	COM6 RXD pin (RS-232)
18	TXD6	COM6 TXD pin (RS-232)
19	GND	GND pin for COM5/COM6
20	DI0	Digital Input channel 0, 3.5 V ~ 30 V
21	DO.PWR	Power Input for Digital Output
22	DO0	Digital Output channel 0, 100 mA, 30 V max.
23	DO1	Digital Output channel 1, 100 mA, 30 V max.

E1: 10/100 Base-TX

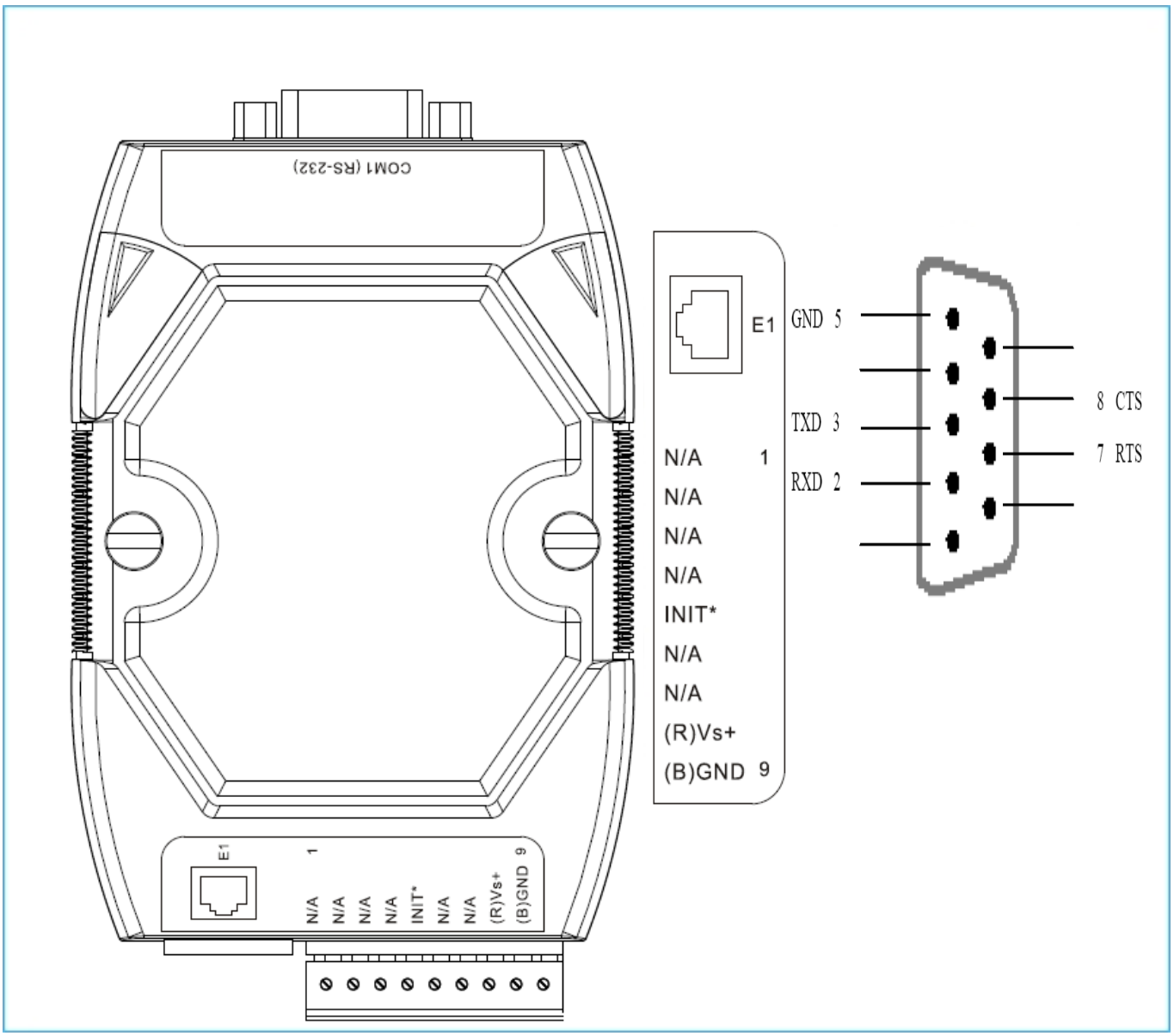
PDS-782/782D Pin Assignments

Only D-version modules have a 5-digit 7-SEG LED.

Pin	Name	Description
1	CTS1	COM1 CTS pin (RS-232)
2	RTS1	COM1 RTS pin (RS-232)
3	RXD1	COM1 RXD pin (RS-232)
4	TXD1	COM1 TXD pin (RS-232)
5	INIT*	Initialization pin (for enabling/disabling AUTOEXEC.BAT)
6	D2+	COM2 Data+ pin (RS-485)
7	D2-	COM2 Data- pin (RS-485)
8	VS+	V+ pin for the power supply (+10 ~ +30 V_{DC} unregulated)
9	GND	GND pin for the power supply (COM1 GND)
10	RXD3	COM3 RXD pin (RS-232)
11	TXD3	COM3 TXD pin (RS-232)
12	RXD4	COM4 RXD pin (RS-232)
13	TXD4	COM4 TXD pin (RS-232)
14	GND	COM3/COM4/COM5/COM6 GND pin
15	RXD5	COM5 RXD pin (RS-232)
16	TXD5	COM5 TXD pin (RS-232)
17	RXD6	COM6 RXD pin (RS-232)
18	TXD6	COM6 TXD pin (RS-232)
19	GND	COM5/COM6/COM7/COM8 GND pin
20	RXD7	COM7 RXD pin (RS-232)
21	TXD7	COM7 TXD pin (RS-232)
22	RXD8	COM8 RXD pin (RS-232)
23	TXD8	COM8 TXD pin (RS-232)

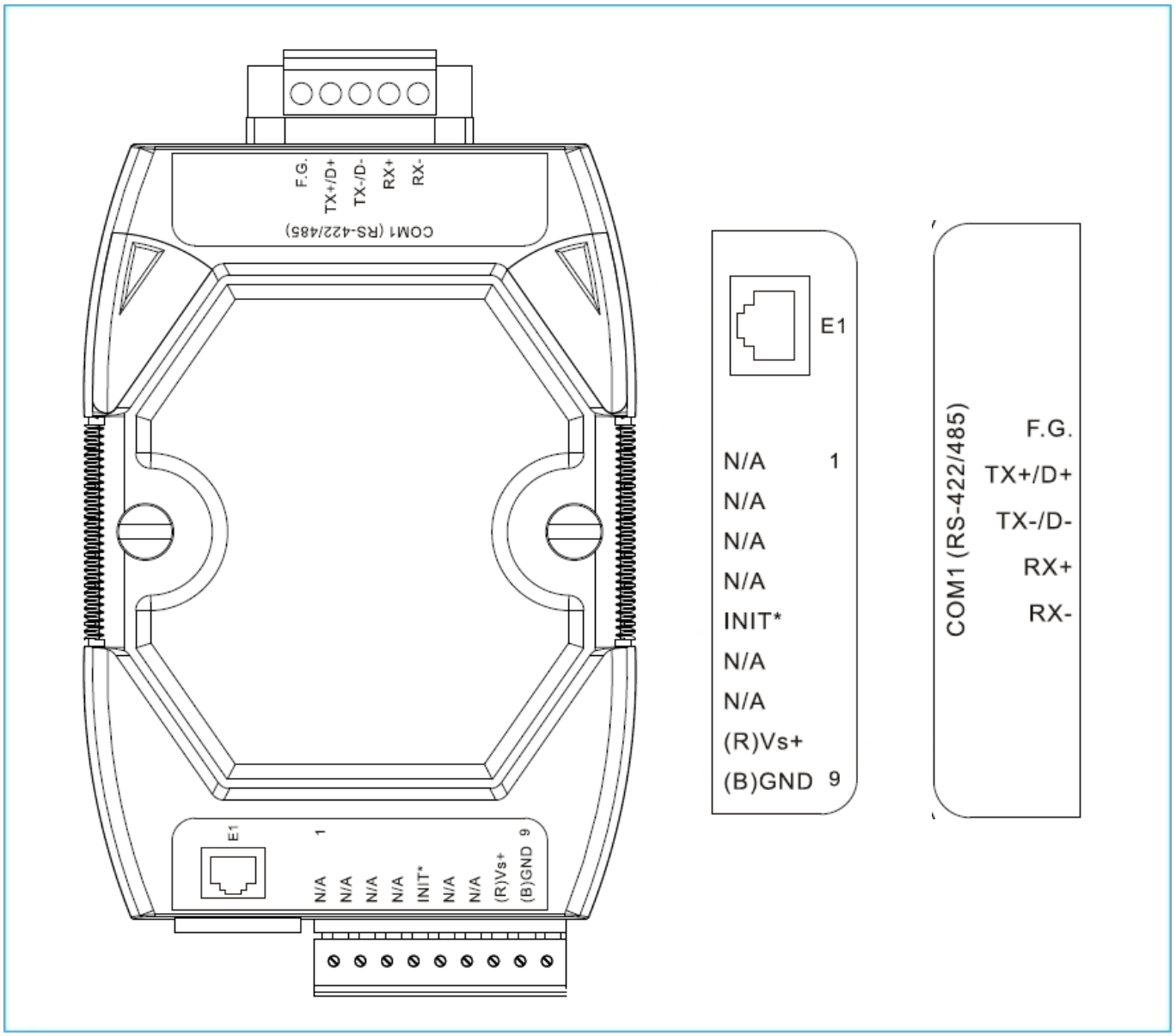
E1: 10/100 Base-TX

DS-712 Pin Assignments



E1: 10/100 Base-TX

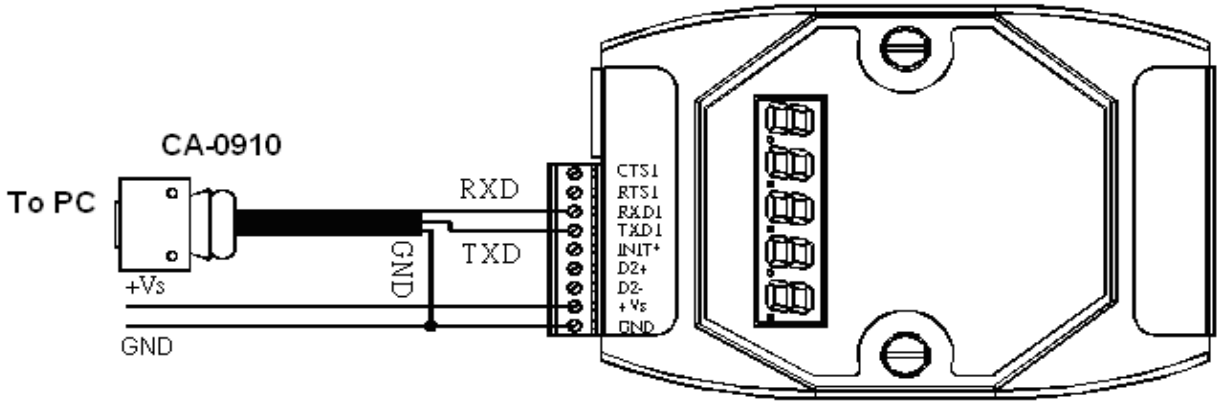
DS-715 Pin Assignments



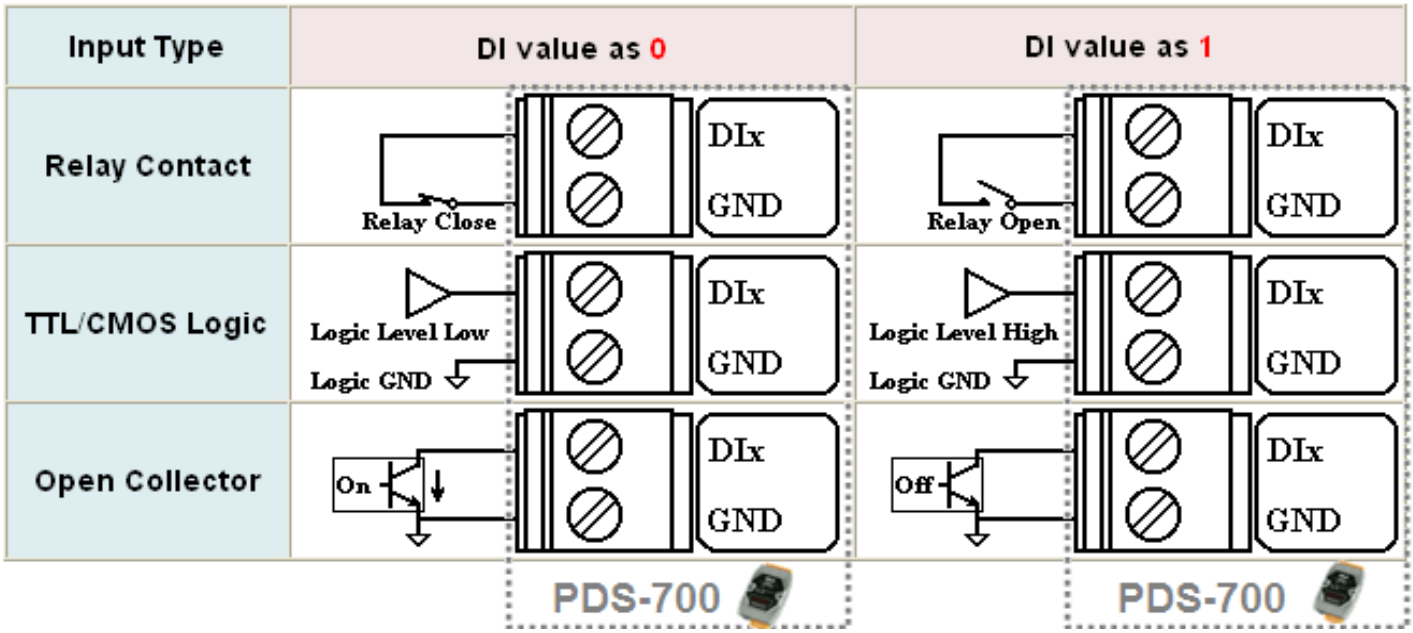
E1: 10/100 Base-TX

3.5. PDS-700 Wiring Connections

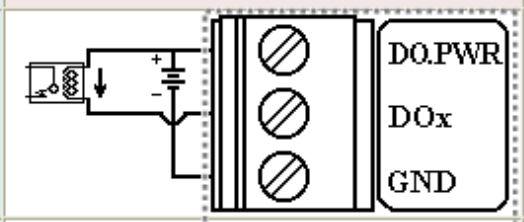
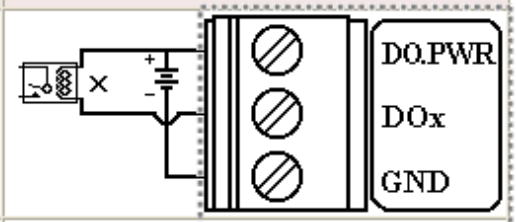
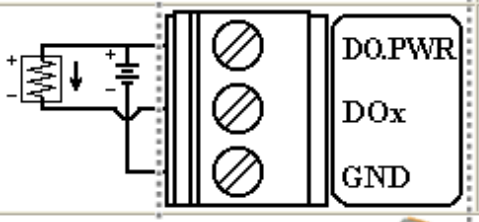
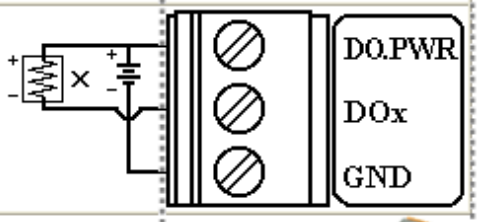
COM1: The COM1 GND-signal is shared with pin9, GND



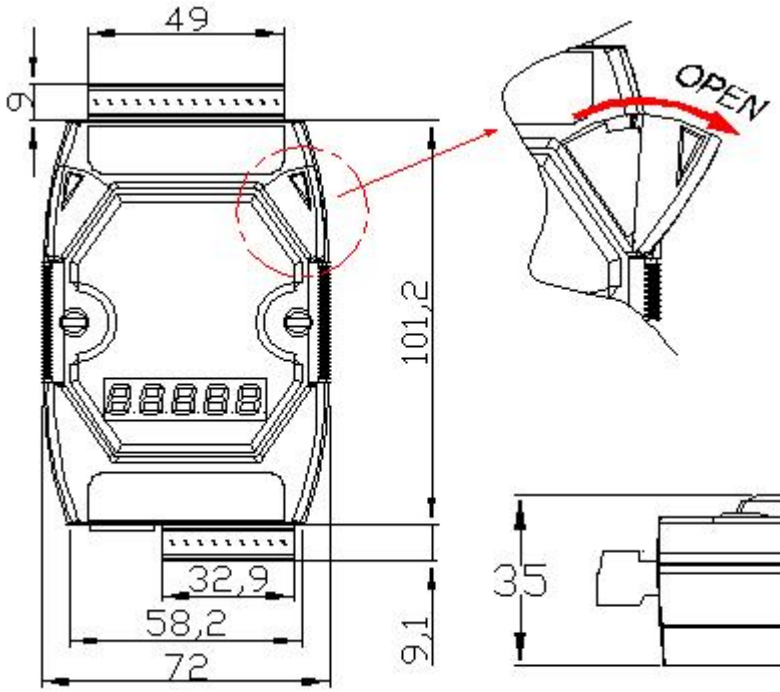
Digital Input



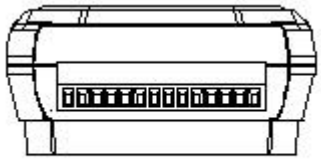
Digital Output

Input Type	ON State DO command as 1	OFF State DO command as 0
Drive Relay		
Resistance Load		
	PDS-700	PDS-700

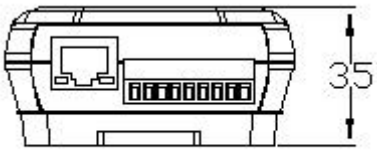
3.6. Dimensions and Mounting



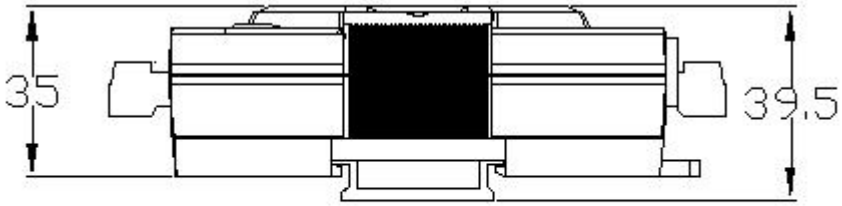
Front View



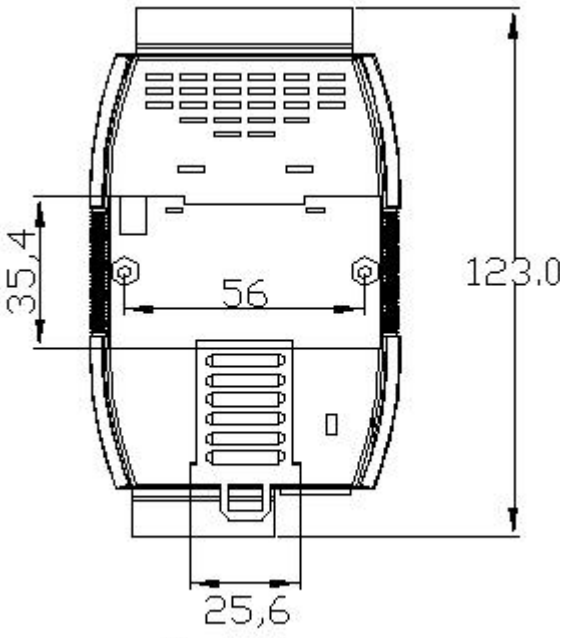
Top View



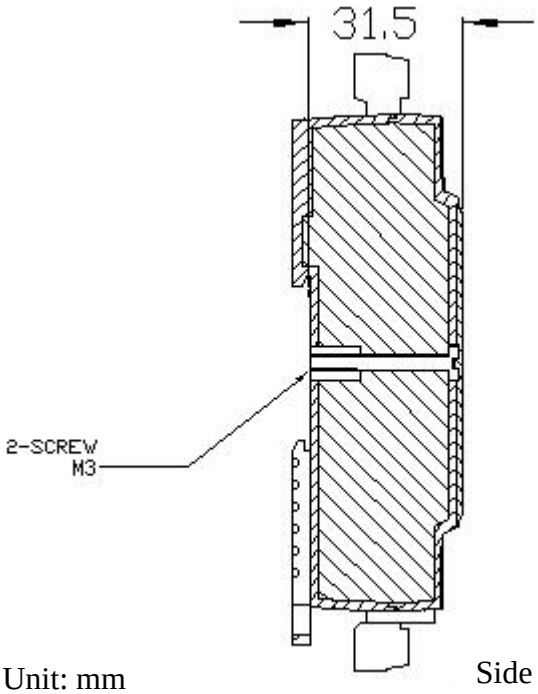
Bottom View



Din-Rail Mounting Bracket

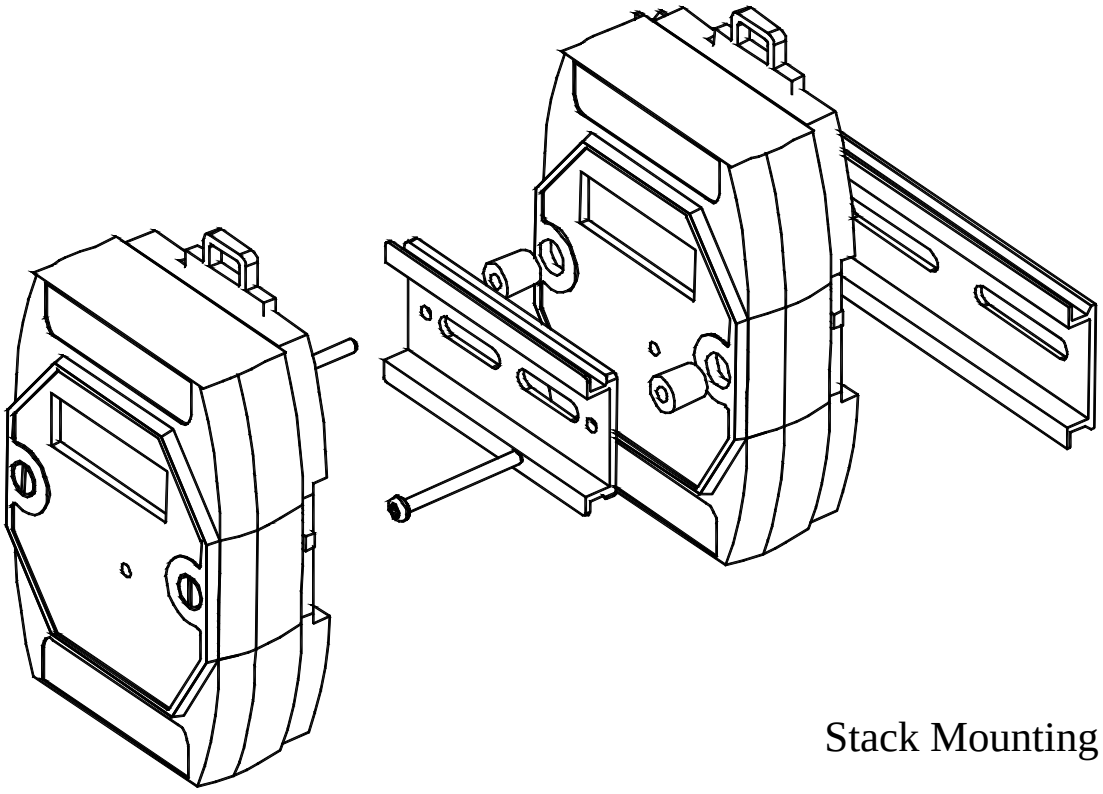


Back View

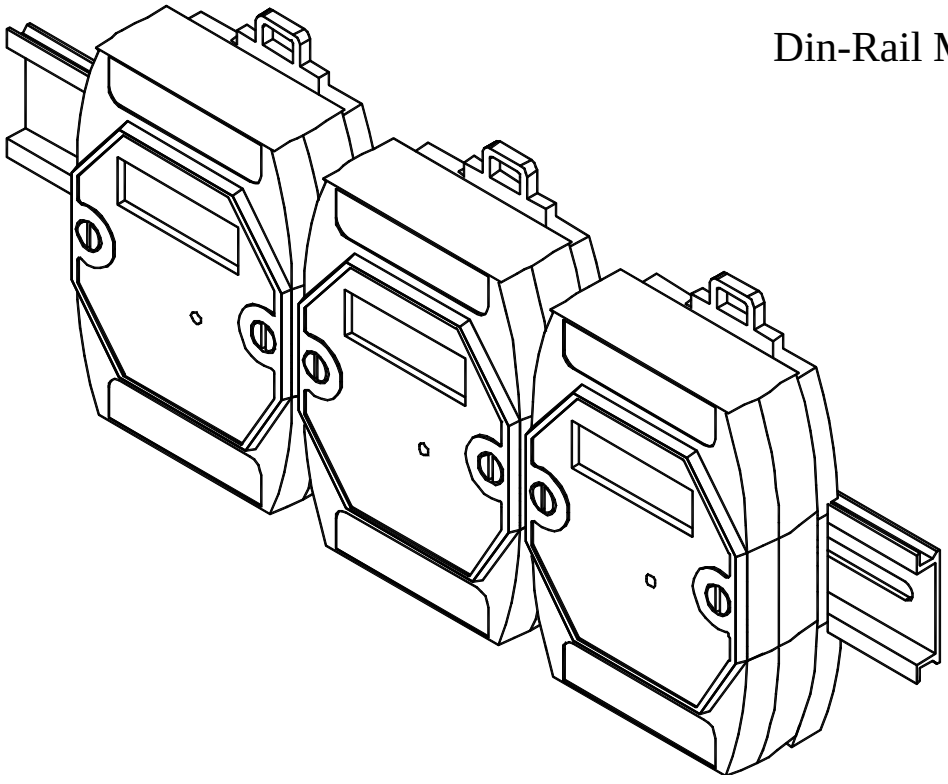


Unit: mm

Side View

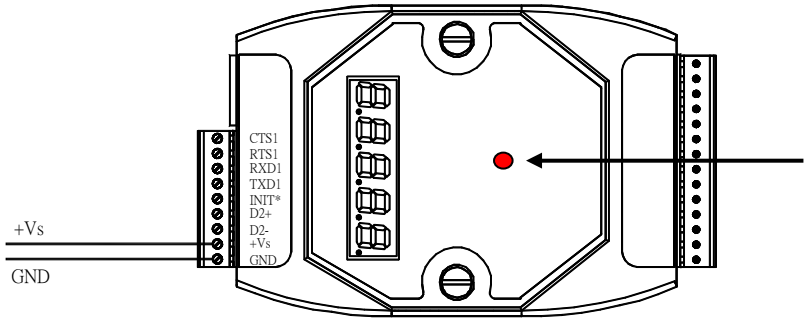


Stack Mounting



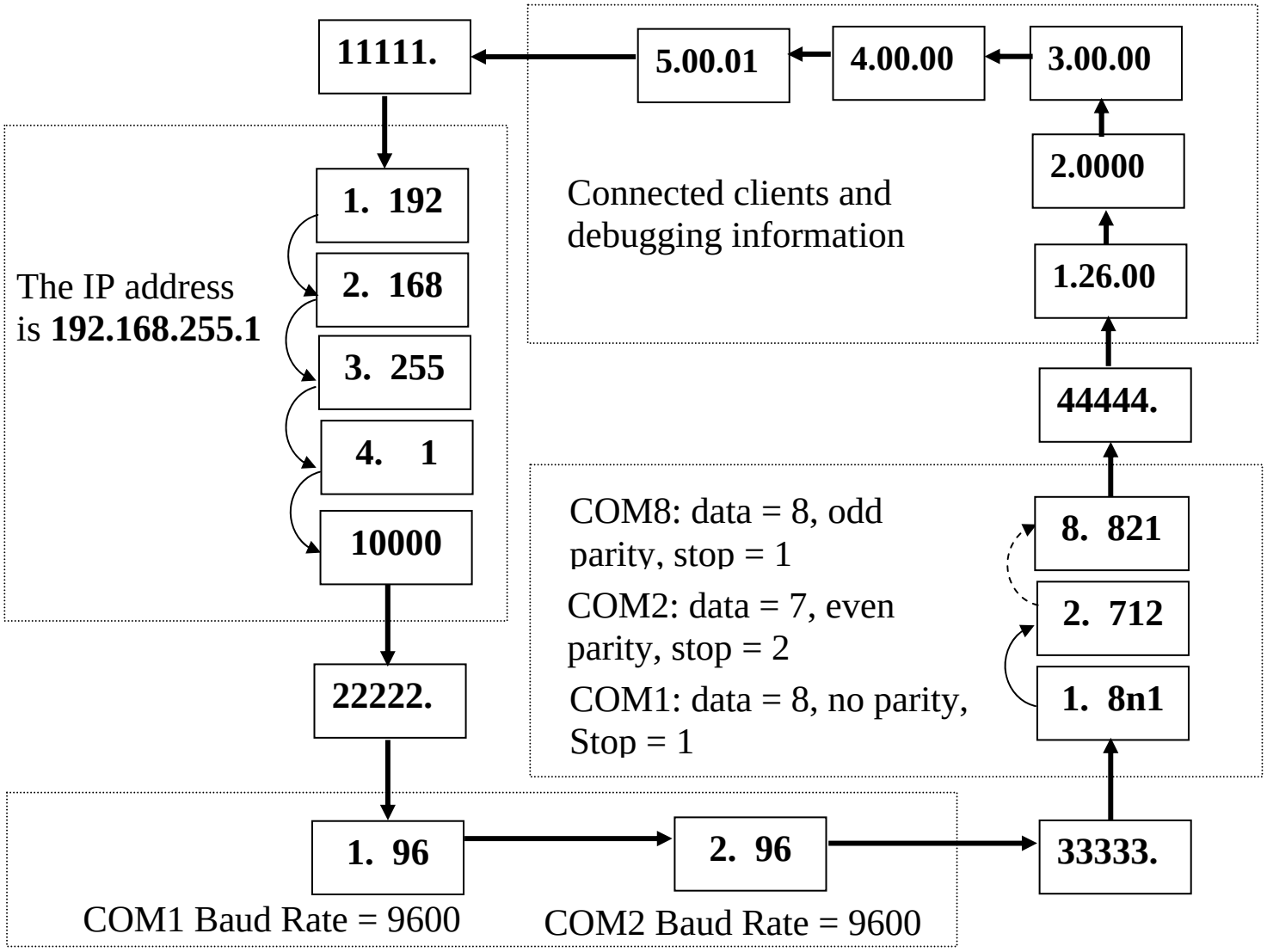
Din-Rail Mounting

3.7. PDS-700/DS-700 series Diagnostics



Step 1: Apply power (+Vs, GND) to the PDS-700/DS-700.
PDS-700 power supply can range from +10 V ~ +30 V.
DS-700/PDS-742-IP67/PDS-782-25 power supply can range from +12 V ~ +48 V.
Step 2: Check the 5-digit 7-SEG LED. Data will be shown as follows.

Note: Only D-version modules have a 5-digit 7-SEG LED.



Information related to the PDS-700 module can be classified into 4 main areas:

- Group ID 11111: The IP address information for the PDS-700
- Group ID 22222: The Baud Rate for all COM Ports
- Group ID 33333: The COM Port configuration
- Group ID 44444: The Connected clients and debugging information for this PDS-700/DS-700

The format for the PDS-700 IP address information is as follows:

- 5-Digit LED Group ID: 11111
- LED -1: indicator, which can be either 1, 2, 3 or 4
- LED -2~5: IP address
- TCP command port (Default = 10000)
- DHCP Setting: disabled (0)/enabled (1)

The LED will initially display the Group ID, and will then display the IP address as illustrated in the previous diagram. If the IP address is changed, the value displayed will change immediately. The default shipping IP is 192.168.255.1 and the display sequence is shown in the previous diagram.

The format for the COM Port Baud Rate information is follows:

- 5-Digit LED Group ID : 22222
- LED-1: COM Port number
- LED-2~5: The Baud Rate determined as (Baud Rate/100)

LED-1 displays the COM Port number, with LED-2~5 showing the Baud Rate for that COM Port. The Baud Rate = (value shown by LED-2~5) * 100. Therefore, a COM Port value displayed as 1.96 means that the Baud Rate of COM1 = 9600 bps; a value displayed as 2.1152 means that the Baud Rate of COM2 = 115200 bps. The Baud Rates for all PDS-700 COM Ports will be shown in sequence.

The format for the COM Port configuration information is as follows:

- 5-digit LED Group ID: 33333
- LED-1: COM Port number
- LED-3: Data Bit: 5 , 6 , 7 or 8
- LED-4: Parity Bit, n = no parity, E = even parity, O = odd parity
  M = mark parity, S = space parity
- LED-5: Stop Bit: 1 or 2

The format for the connected clients and debugging information is as follows:

- 5-digit LED Group ID: 44444
- LED-1 will display 1, 2, 3, 4, 5 and the module name in sequence.
- When LED-1 is 1, LED-2/3 indicates the number of available free sockets (default is 26 for PDS-700), and LED-4/5 shows the number of sockets being used by clients (default is 0), e.g. 12600
- When LED-1 is 2, LED-2~5 indicates how many times the PDS-700 has been reset, e.g. 20002 (The PDS-700 has been reset 2 times)
- When LED-1 is 3, the display indicates how many Ethernet packets are currently being received by the PDS-700.
- When LED-1 is 4, the display indicates that the status of the internal Flag used to allow Ethernet packets to be sent is 0 or 1.
- When LED-1 is 5, the display indicates the number of times the Ethernet chip has been reset.
- Module Name: dS.7xx

When the PDS-700 is first powered-up or if it has just been reset, the reset state = 1. If any client connects to the PDS-700, the reset state will be changed to 0. In addition, the number of free sockets will be decreased and the number of used sockets will be increased. If the number of free sockets is reduced to 0, then no additional clients will be able to link to the PDS-700. The default number of free-sockets for the PDS-700 is 26. Therefore, the server (VxComm firmware or Xserver firmware) allows 26 connections to be linked to a single PDS-700. Each client program occupies at least 2 connections for a single serial port, one connection for data and another for commands.

If the 5-digit LEDs do not display the above detail, take the following steps:

- Power off the module
- Connect the INIT* pin to the VS+ pin
- Power on the module and double check the configuration

Step 3: The red LED on the PDS-700/DS-700 is used to indicate the following:

- → ON
- → OFF
- Unit → 0.5 second

OS	➔										
M0	➔										
M1	➔										
M2	➔										

The PDS-700/DS-700 contains either Xserver or VxComm as default when shipped that is in the OS mode.

If the LED is always ON, take the following steps:

- Power off the module
- Connect the INIT* pin to the VS+ pin
- Power on the module and double check the configuration

Step 4: Power off the module.

4. Setting up the PDS-700/DS-700 module

Step 1: Connect the PDS-700/DS-700 module to the Ethernet Network

Before connecting the PDS-700/DS-700 module to an Ethernet network, the following items are needed:

1. Power Supply： 10 ~ 30 V_{DC} (for PDS-700)
   12 ~ 48 V_{DC} (for DS-700/PDS-742-IP67/PDS-782-25)(eg： DP-665:
   http://www.icpdas.com/products/Accessories/power_supply/power_list.htm)

2. Hub (eg： NS-205
   http://www.icpdas.com/products/Switch/industrial/industrial_list.htm)

3. The network settings in the PC are correctly configured and the Ethernet connection is functioning normally.

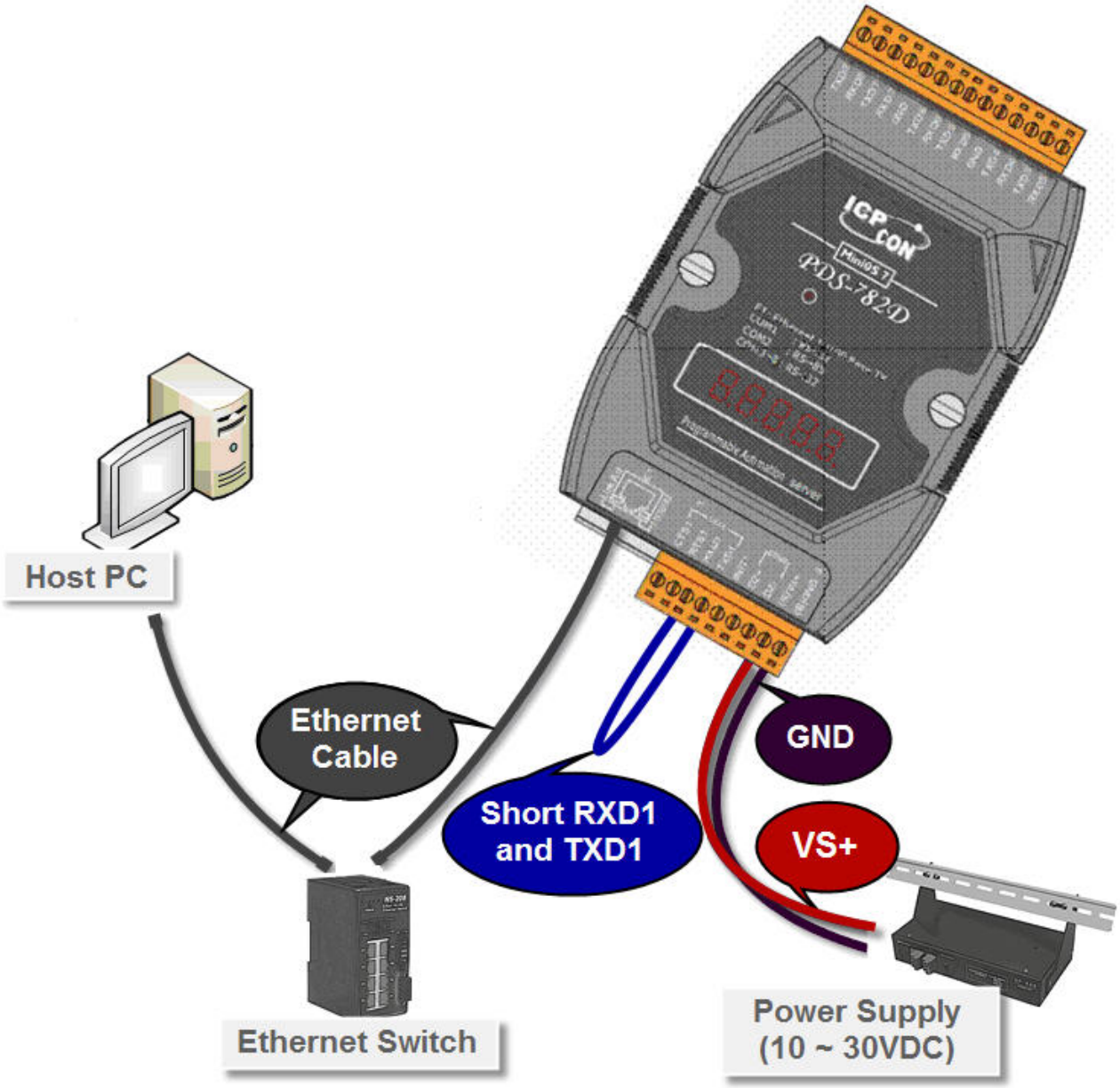
4. Disable or correctly configure the Windows firewall and any Anti-Virus software firewall first or else the "**Search Servers**" function in the VxComm Utility may not work. (Contact your System Administrator for more details of how to do this.)

5. Connect the PDS-700/DS-700 module to the Ethernet as shown on the following page and switch on the power.

6. Make sure the indicator LED is flashing.

If your PDS-700 module is a D-version module, the 5-digit 7-SEG LED will be used to indicate the system information described in Sec. 3.7

7. Install VxComm Utility on your PC
The software is located at：
CD: \Napdos\7188e\tcp\vxcomm\driver(pc)\
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7188e/tcp/vxcomm/driver(pc)/



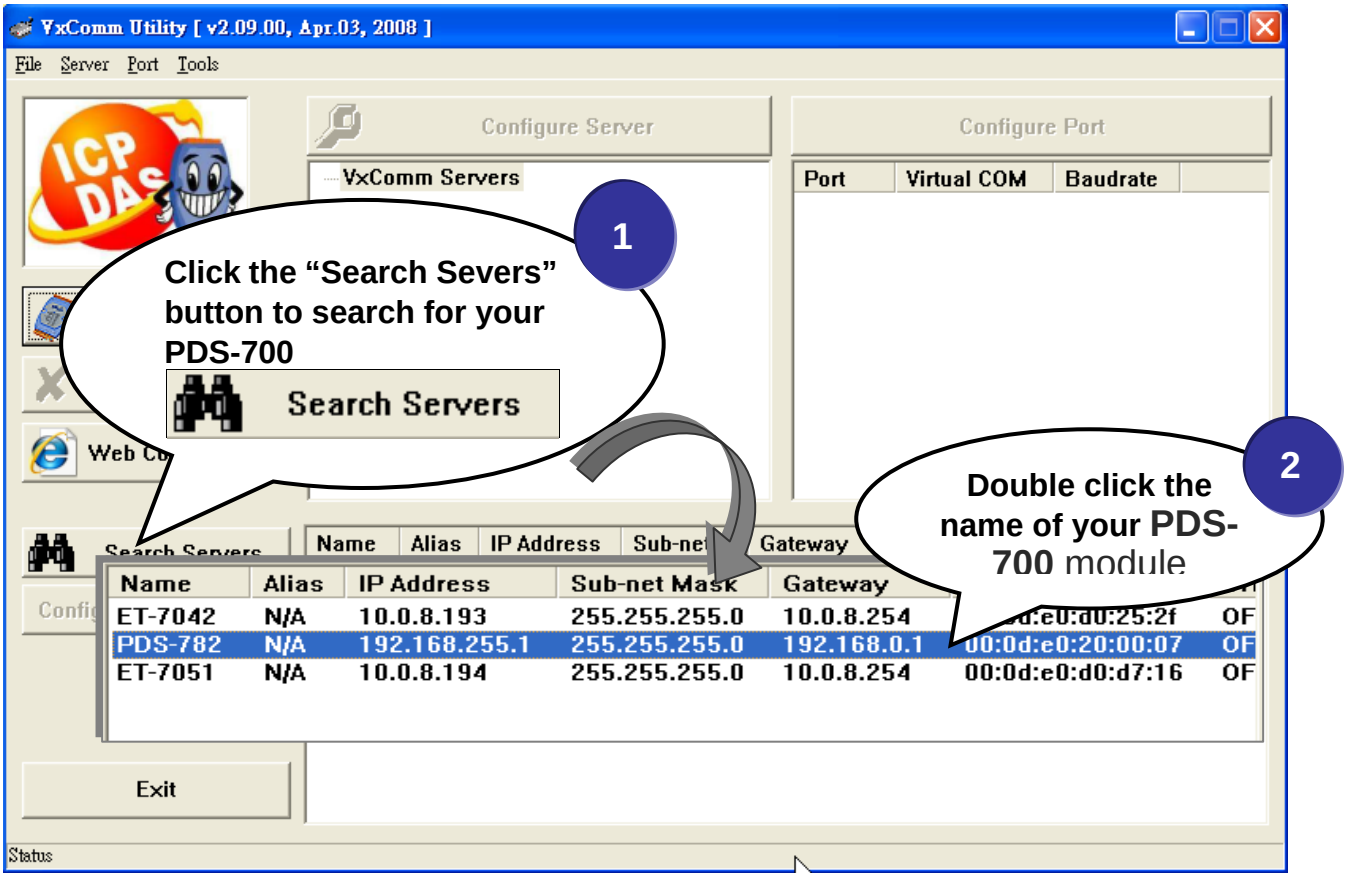
Connect both the PDS-700/DS-700 module and your computer to the same sub network or the same Ethernet Switch.

Short the RXD1 and TXD1 pins of the PDS-700 module for execute a self-test.

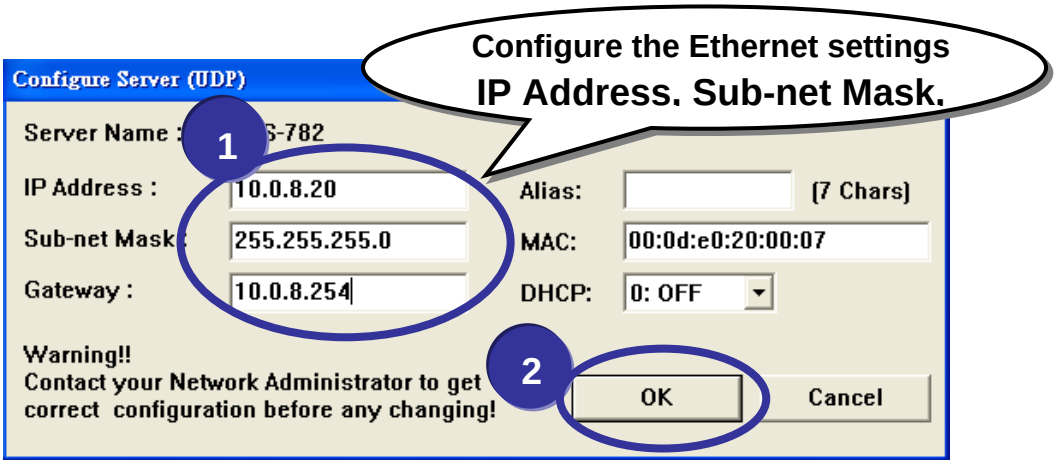
Supply 24 V_{DC} (10 ~ 30 V_{DC}) power to the PDS-700 module.
Supply 24 V_{DC} (12 ~ 48 V_{DC}) power to the DS-700/PDS-742-IP67/PDS-782-25 module.

Step 2: Search for the PDS-700/DS-700 module on the Ethernet network

1. Execute the VxComm Utility and then search for your PDS-700/DS-700 module.
2. Double click the name of the PDS-700/DS-700 to open the configuration settings dialog box.

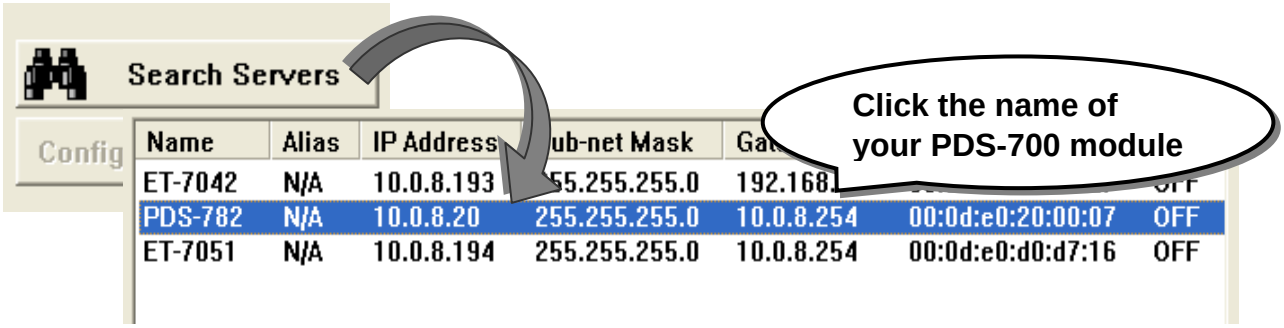


3. Contact your Network Administrator to obtain the correct network configuration details (such as IP/Mask/Gateway). Enter the network settings and then click "OK". The PDS-700/DS-700 module will be restarted itself immediately.



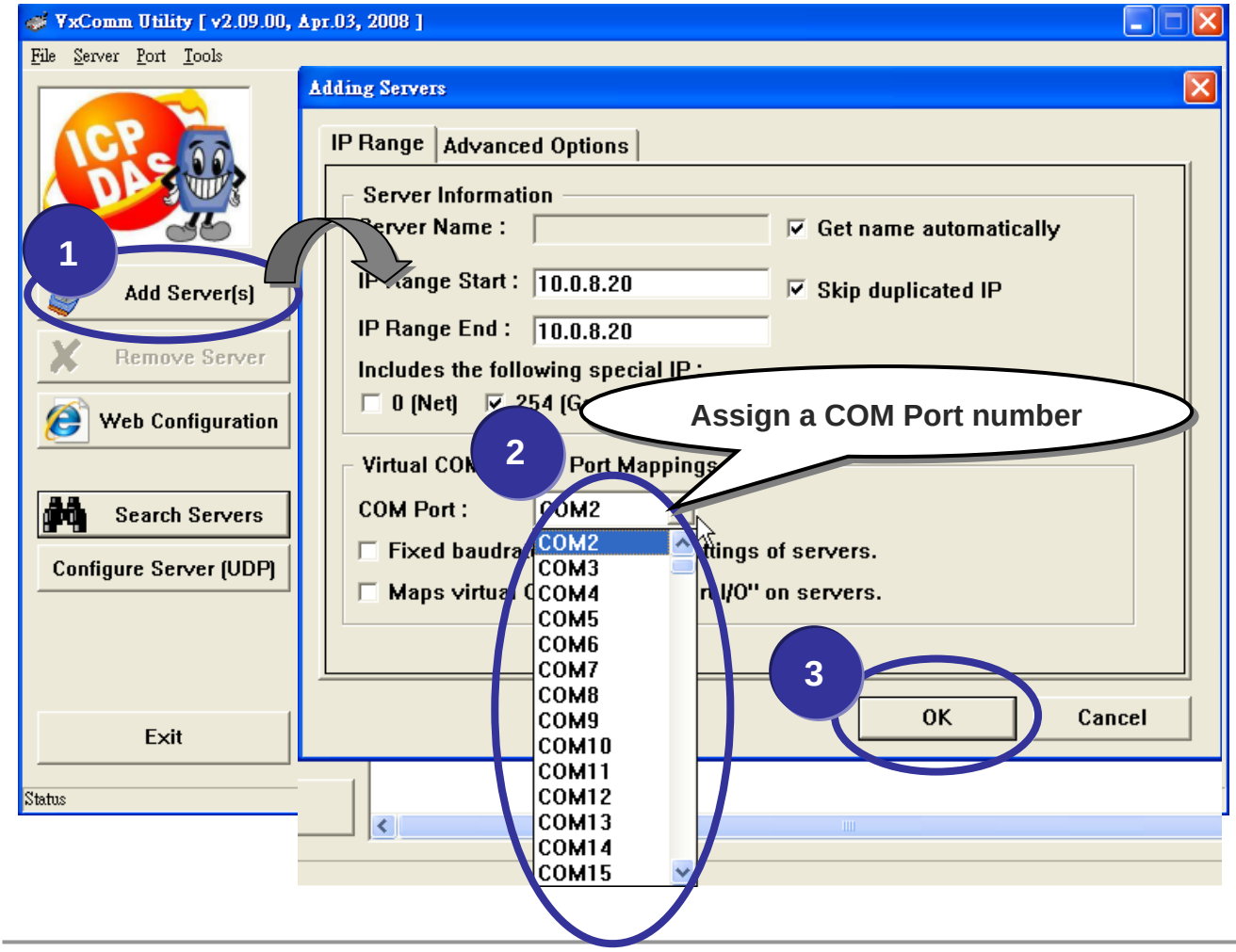
Step 3: Configuring Virtual COM Ports

1. Click the “Search Servers” button again to search for your PDS-700/DS-700 module to make sure that the new IP/Mask/Gateway settings have been saved, then click the name of your PDS-700/DS-700 module once to select it.

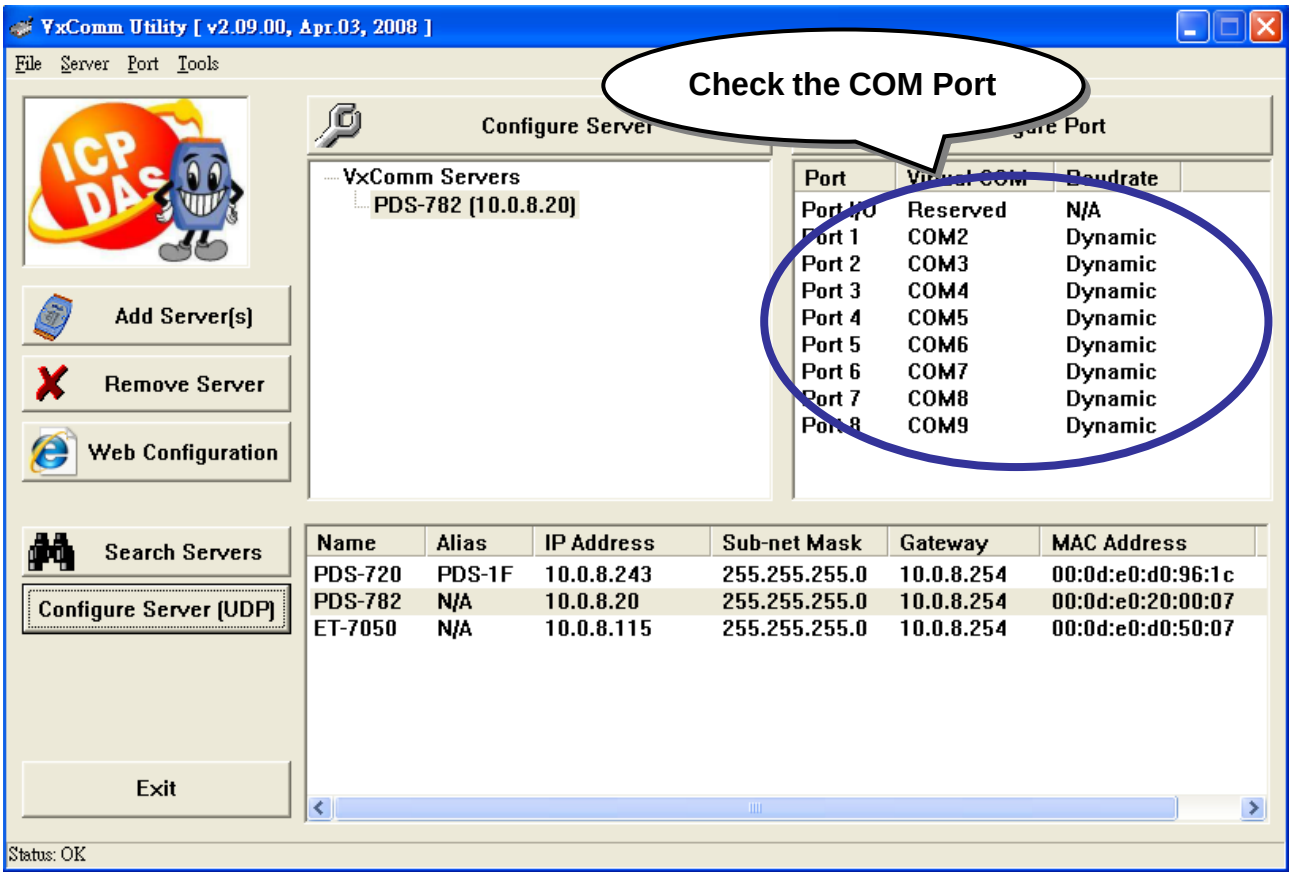


2. Click the

button, then assign a COM Port number and click “OK” to save your settings.



3. Check the Virtual COM port numbers on the PC.



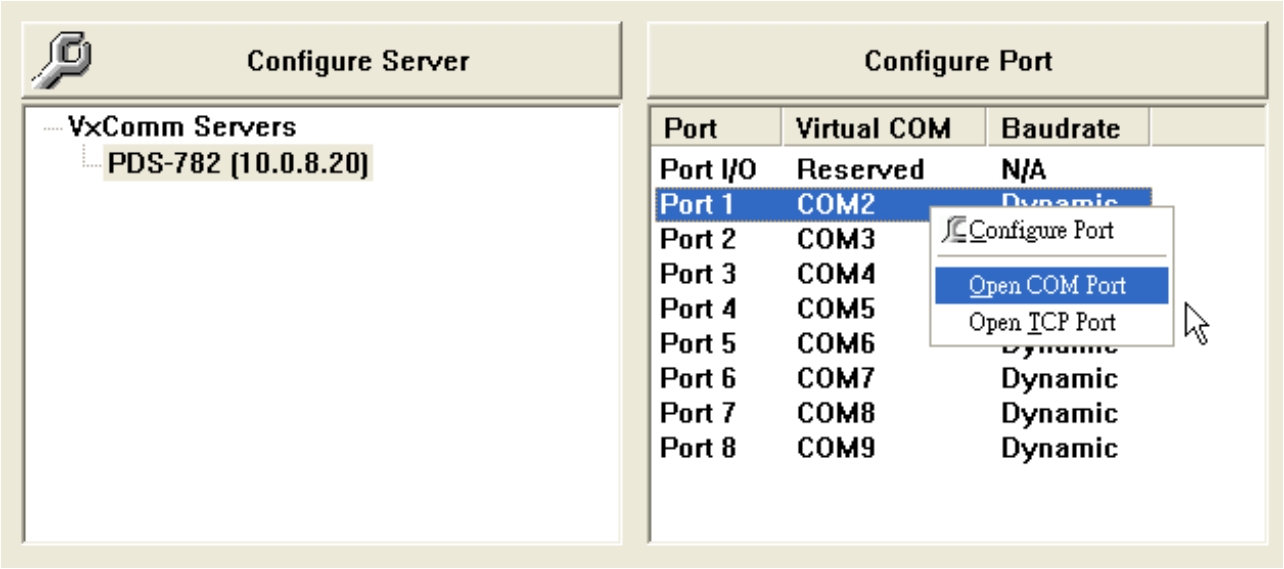
5. Click "**Restart Driver**" from the "**Tools**" menu, and then click the "**Restart Driver**" button to start the driver.

VxComm Utility [v2.09.00, Apr.03, 2008]
File Server
Restart Driver
VxComm Utility : Restarting Driver
STOP
Make sure you have closed all virtual COM ports first.
Click the "Restart Driver" button to start the driver
Restart Driver
Cancel

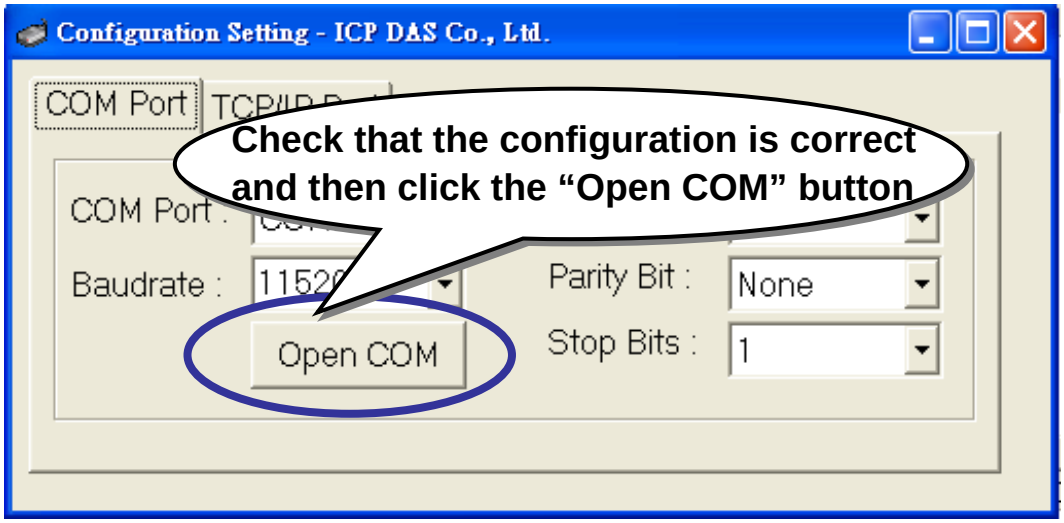
Step4: Testing your PDS-700

1. Connect the “RXD1” and the “TXD1” of the PDS-700 module, as shown in the diagram in Step1.

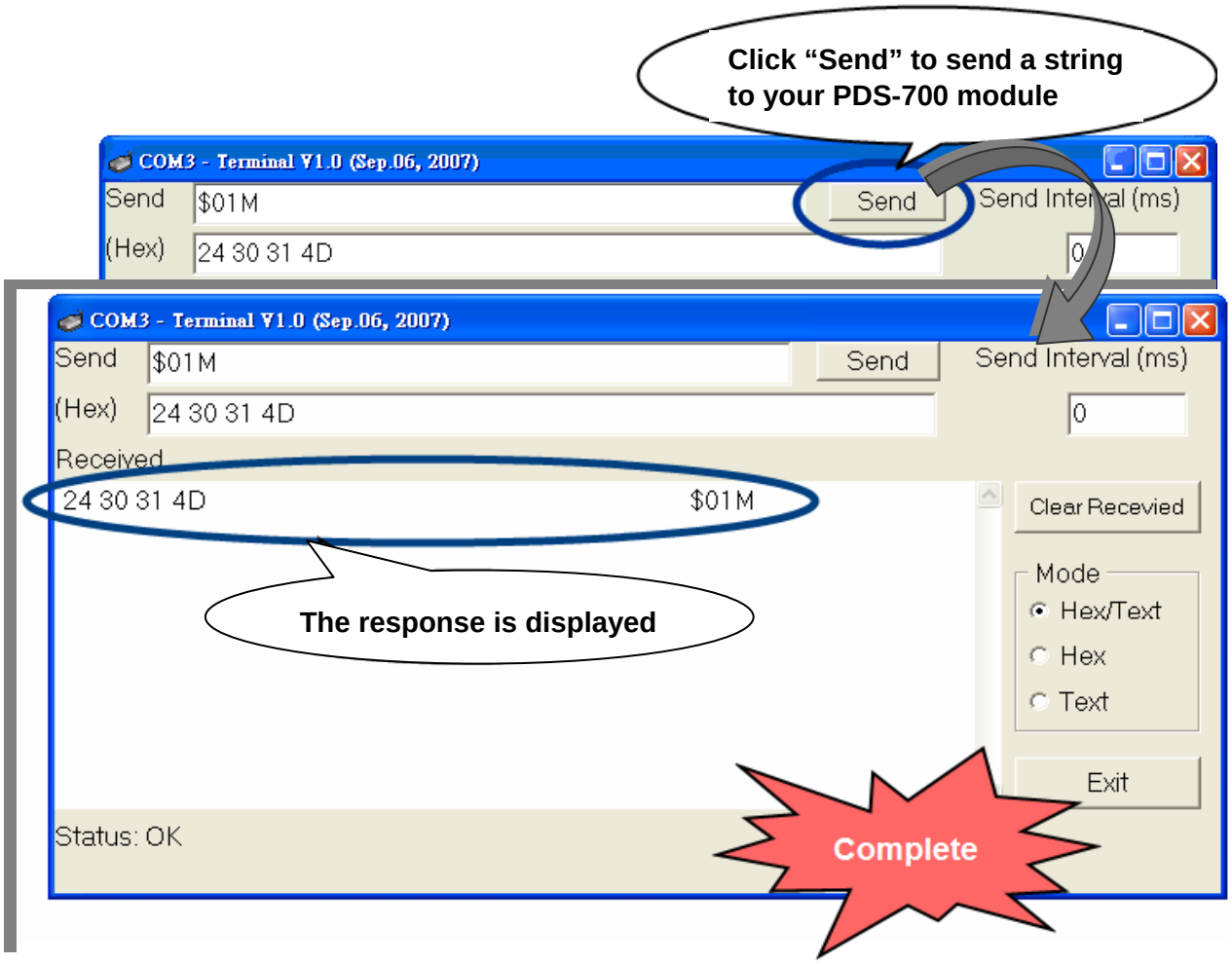
2. Right click Port 1 and then choose the “**Open COM Port**” option.



3. Check that the configuration of the COM Port is correct and then click the “**Open COM**” button.



4. Type a string in the send field then click the send button. If a response is received, it will be displayed in the received field.



5. If the test is successful, the COM port program will be able to work directly by setting the Virtual COM Port number.

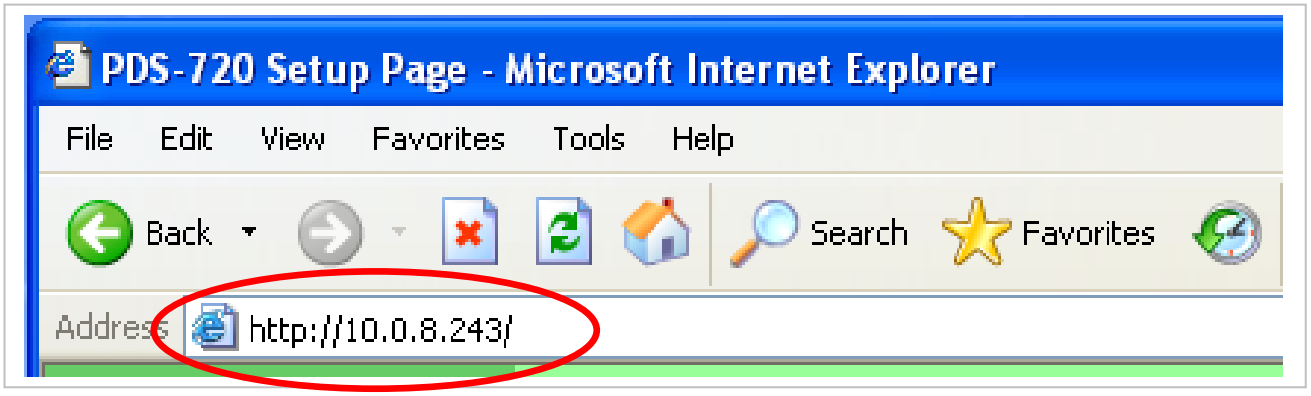
5. Configuration with Web Browser

Once the PDS-700/DS-700 module has been correctly configured and is networking normally, the configuration details can be retrieved or amended using either the VxComm Utility or a standard web browser, such as IE, FireFox, or Mozilla, etc.

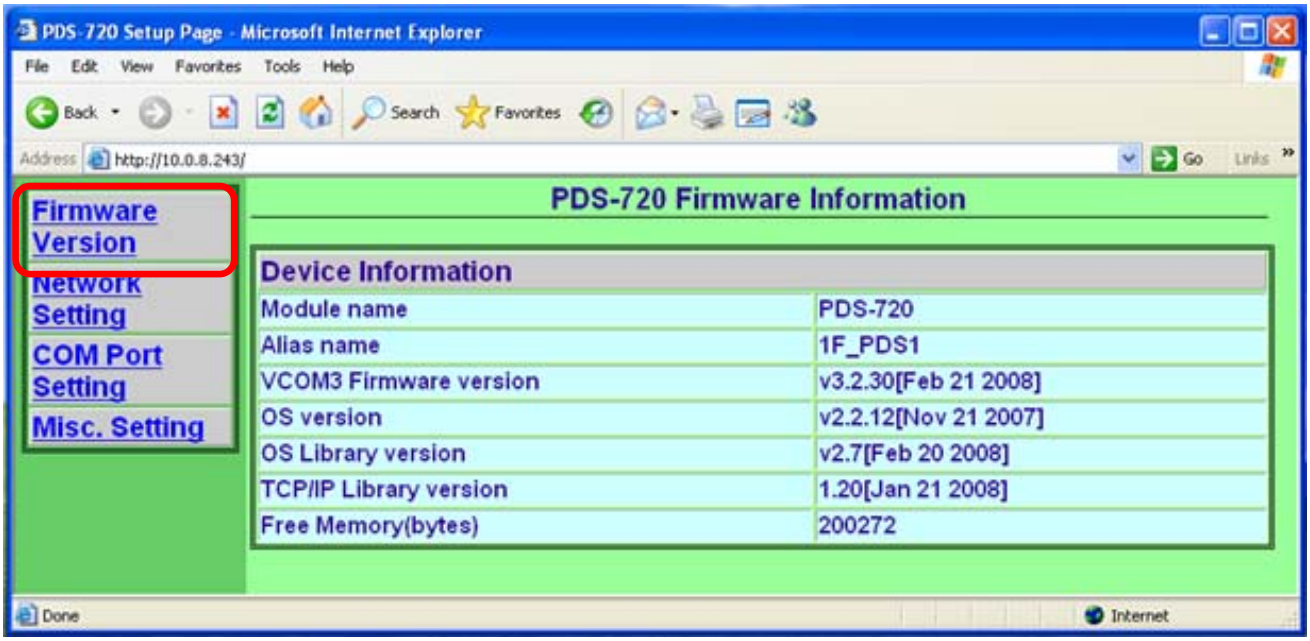
5.1. Connecting to the PDS-700/DS-700 Module

If the COM port program is operating with a PDS-700/DS-700, changing the configuration will cause a program error.

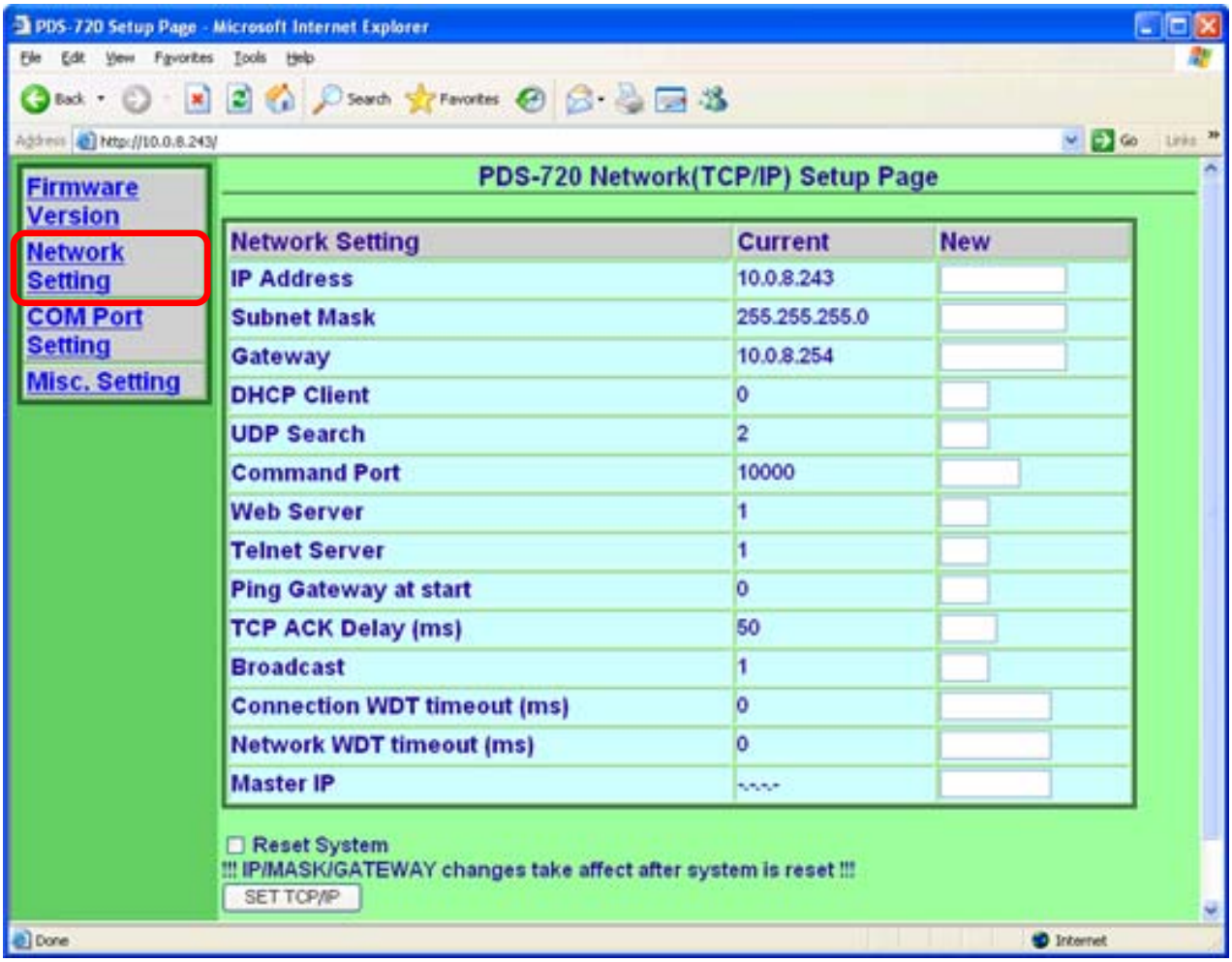
Enter the IP address of the PDS-700/DS-700 module in the Address field and press "Enter" to connect to the PDS-700/DS-700 module.



When the browser connects to the PDS-700/DS-700, the first page that will be display is the Firmware Information page.



5.2. Network Settings



Network (TCP/IP) Setup page

- **IP Address**
- **Subnet Mask**
- **Gateway**

The above three items are the most important network settings and should always correspond to the LAN definition. If they do not match, the PDS-700/DS-700 module will not operate correctly. If the settings are changed while the module is operating, any links to Virtual COM Port based applications currently in use will be lost and an error will occur.

- **DHCP Client** : 0 = disabled, 1 = enabled

It is recommended that the DHCP Client setting is kept as disabled, and using static network settings. This ensures your PDS-700/DS-700 always using a fixed IP address, and you don't need to configure the virtual COM mappings again and again.

- **UDP Search**: 0 = disabled, 1 = always enabled.

2 = enable the UDP Search function until another client is connected. (Default = 2)

By keeping the UDP search setting as 2, the PDS loading will be reduced. The VxComm Utility will not be able to search for this module until this module's clients are all disconneted.

- **Command Port**

The default Command Port is 10000.

- **Web Server**
- **Telnet Server**

0 = disabled, 1 = enabled

- **Ping Gateway at start**: 0 = disabled, 1 = enabled.

If the setting is 1 (enabled), the PDS-700/DS-700 module will send a ping packet to the gateway during the power-on stage. It is used to inform the gateway that a PDS-700/DS-700 (itself) has joined the network.

- **TCP ACK Delay (ms)**, default = 50.

PDS-700/DS-700 does not want to send an empty ACK followed by a TCP data packet 1ms later, every time. So it delays a little (TCP ACK Delay), and then can combine the ACK and data packet into one. This efficiency reduces the number of packets and reduces network loadings.

- **Broadcast**
  1 = receive UDP broadcast packets
  0 = reject UDP broadcast packets

- **Connection WDT timeout (ms)**: default = 0 (disabled), min. = 10000.

If the PDS-700/DS-700 module does not receive any data from a client PC within the period of the "Connection WDT timeout", the module will close the connection to the client.

- **Network WDT timeout (ms)**: 0 = disabled, min. = 30000.

If the PDS-700/DS-700 module does not receive any data from any of the clients within the period of the "Network WDT timeout", the module will reboot itself. The default setting should be 300000ms (= 300 seconds).

This setting is the same as "SystemTimeout" setting (unit: ms) on Console/Telnet command, and is the same as "/STxxx" in command line parameter (unit: seconds).

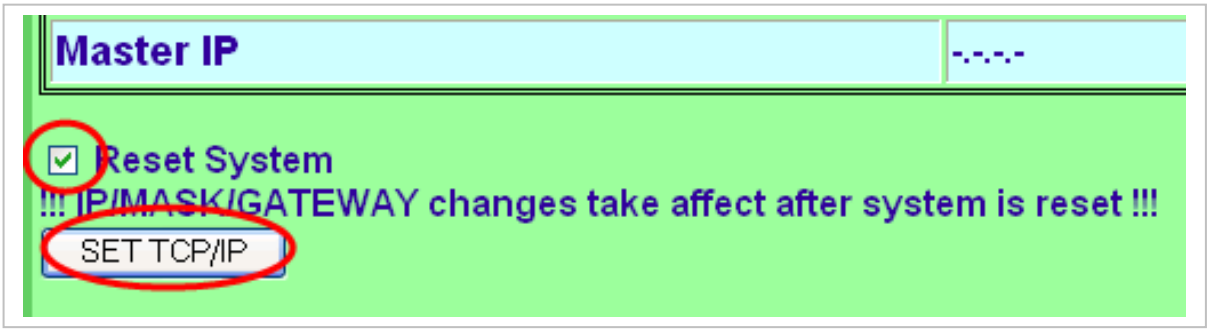
When user uses "config=RESET" Console/Telnet command to clear the EEPROM, the "Network WDT timeout" (SystemTimeout, /ST) setting will also be cleared to 0.

Users have to configure this setting again by "SystemTimeout" Console/Telnet command.

- **Master IP**: default = empty (disabled).

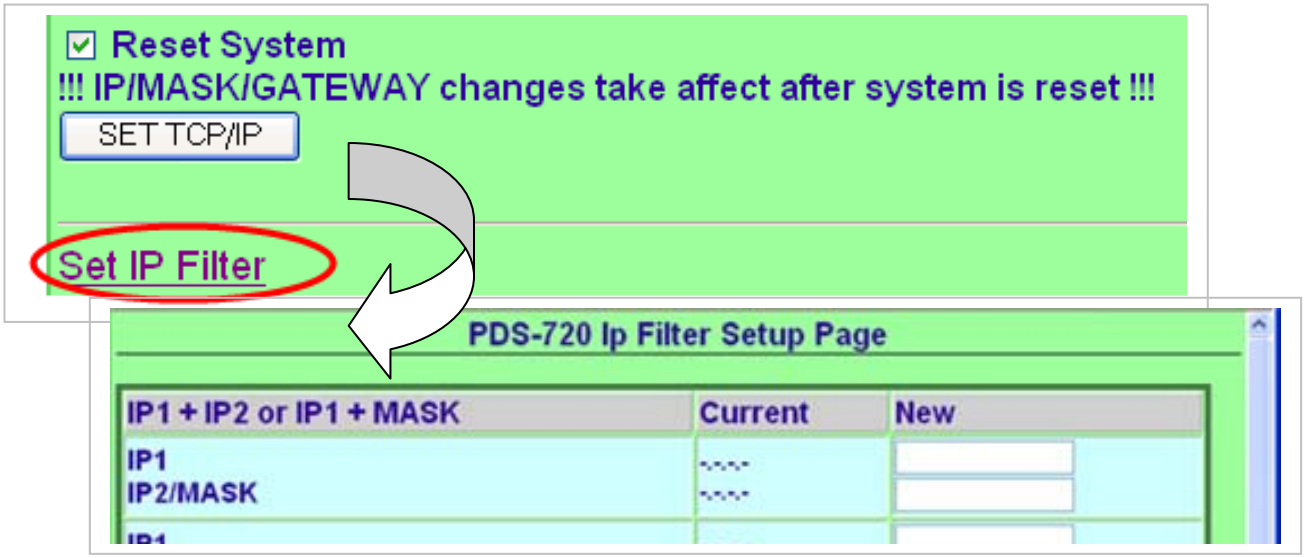
If the Master IP is set, only the client using Master IP can change the COM Port configuration. It is to prevent the COM Port configuration changed by other clients.

After setting the new configuration, click the "**Set TCP/IP**" button to save the new settings to the PDS-700/DS-700 module. If the "Reset System" option is checked, the PDS-700/DS-700 module will reboot itself after the saving operation is complete, otherwise the original settings will still be valid until the next power-on.



5.3. IP filter setting

The IP filter setting limits which client PCs are able to link to the PDS-700/DS-700 module via specific IP addresses. When one or more IP addresses are set in the filter table, only client PCs where the IP address is included in the range listed of the filter table will be able to connect to the PDS-700/DS-700 module. Any requests from other PCs will be rejected



- **Set IP1 only**: only clients who's IP address is included in the filter table are able to connect to the PDS-700/DS-700 module.

- **Set IP1 + IP2**: set a range of IP address as a starting and ending point. The setting allows clients who's IP address is included in the range are able to connect to the PDS-700/DS-700 module.

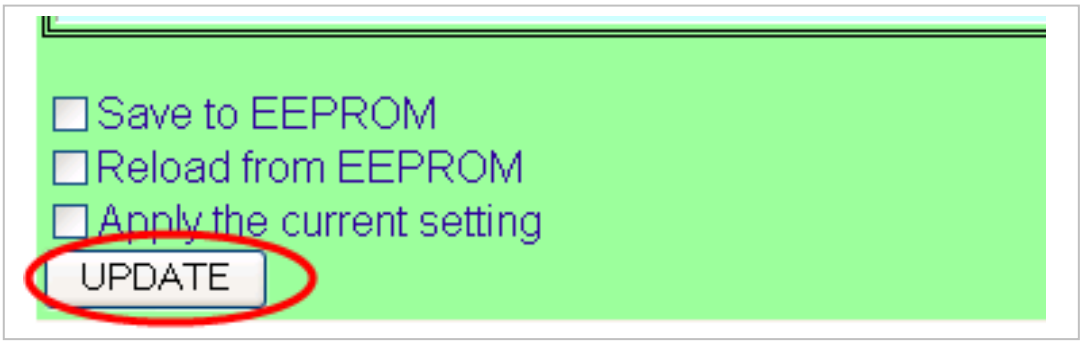
- **Set IP1+Mask**: set the IP filter range as:
  (IP1 & Mask) + 0 ~ (IP1 & Mask) + (~Mask).

Only clients who's IP address is included in the range are able to connect to the PDS-700/DS-700 module. For instance:

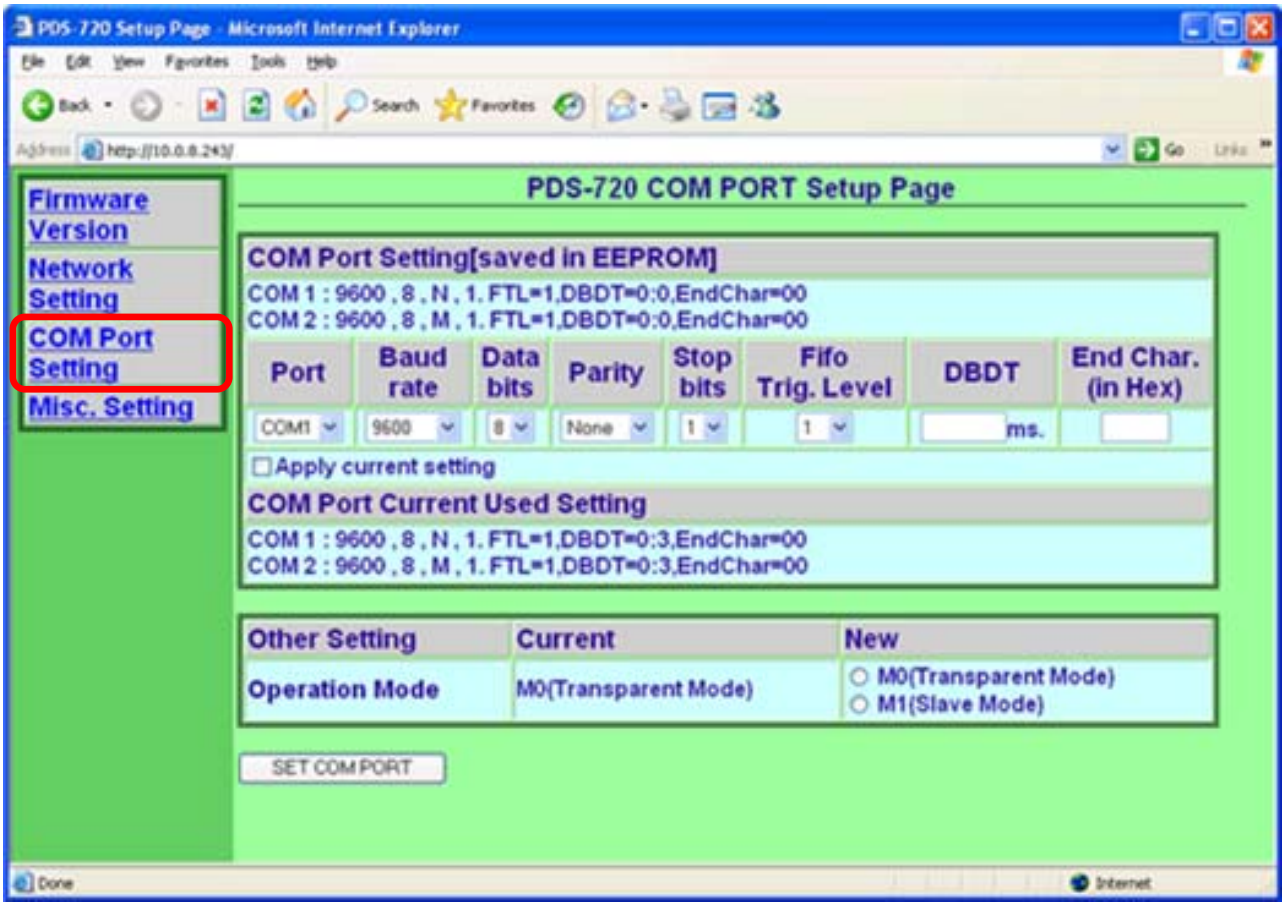
IP1 = 10.0.9.5, mask = 255.255.255.0
IP1 & MASK = 10.0.9.0, ~mask = 0.0.0.255

This allows clients who's IP address is included in the range of 10.0.9.0 ~ 10.0.9.255 are able to connect to the PDS-700/DS-700 module.

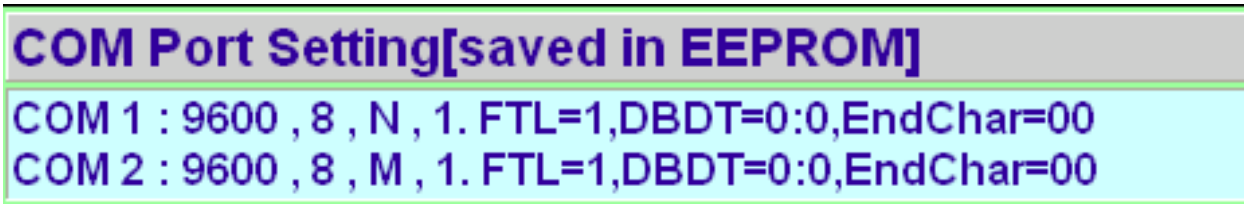
- Click the "**Update**" button to validate the settings.



5.4. COM Port Settings

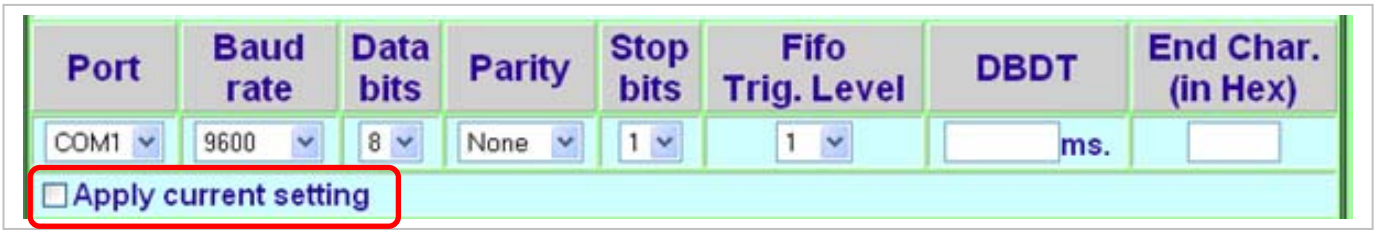


- The COM Port Settings list is saved in the EEPROM on the PDS-700/DS-700 module.



- The Currently Used COM Port Settings list

- The COM Port Settings area



Note: If the "**Set COM Port**" button is clicked without checking "**Apply current setting**", option the new settings will be saved to the PDS-700/DS-700 only and the new settings will be valid after the next power-on.

If the "**Apply current setting**" checked when the "**Set COM Port**" button is clicked, the new settings will be valid immediately.

- **Port**: The COM Port number on the PDS-700/DS-700 module.

- **Baud Rate, Data Bits, Parity**
- **Stops Bits, End Character**:
  The configuration settings should match the serial device used.

- **Fifo Trig. Level**: FIFO trigger level
  This option is used to set the number of characters that the COM Port can receive at once time, the PDS will move the data from the COM Port FIFO to the PDS. If the amount of data transferred is large and uses a transfer speed (115200 bps), setting a smaller value is helpful in preventing data loss.

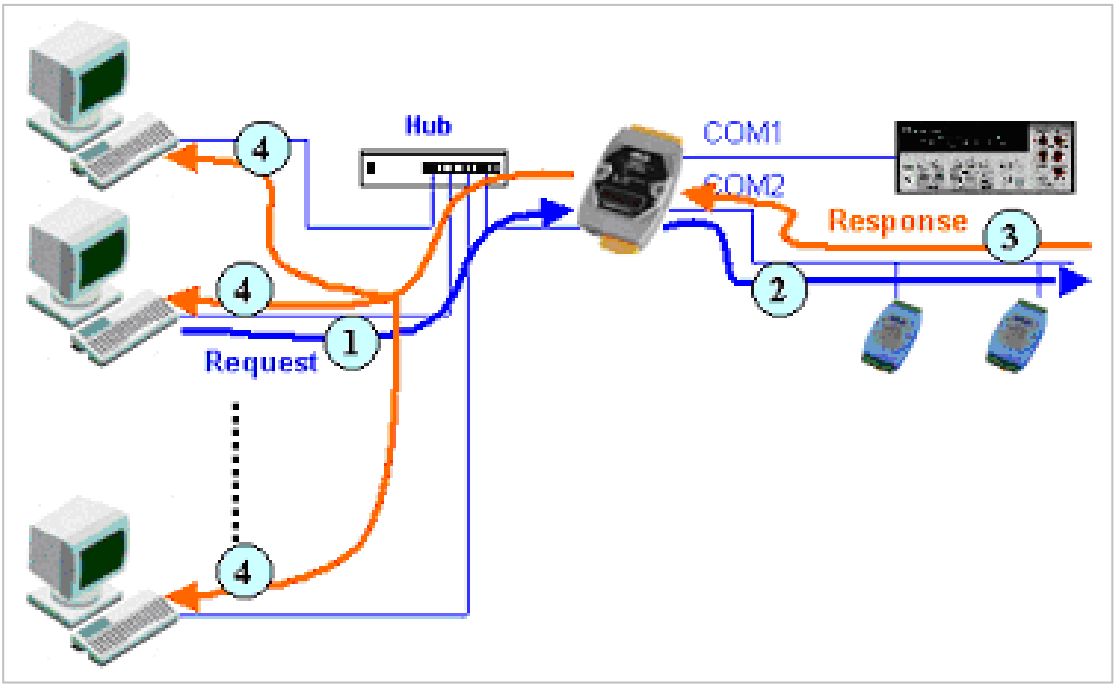
- **DBDT (ms)**: Data buffer delay timeout
  When the COM port does not receive data from devices connected over the period of DBDT setting, the PDS-700/DS-700 will determine that the data transfer is over and return to process next tasks.

Other settings: M0 mode

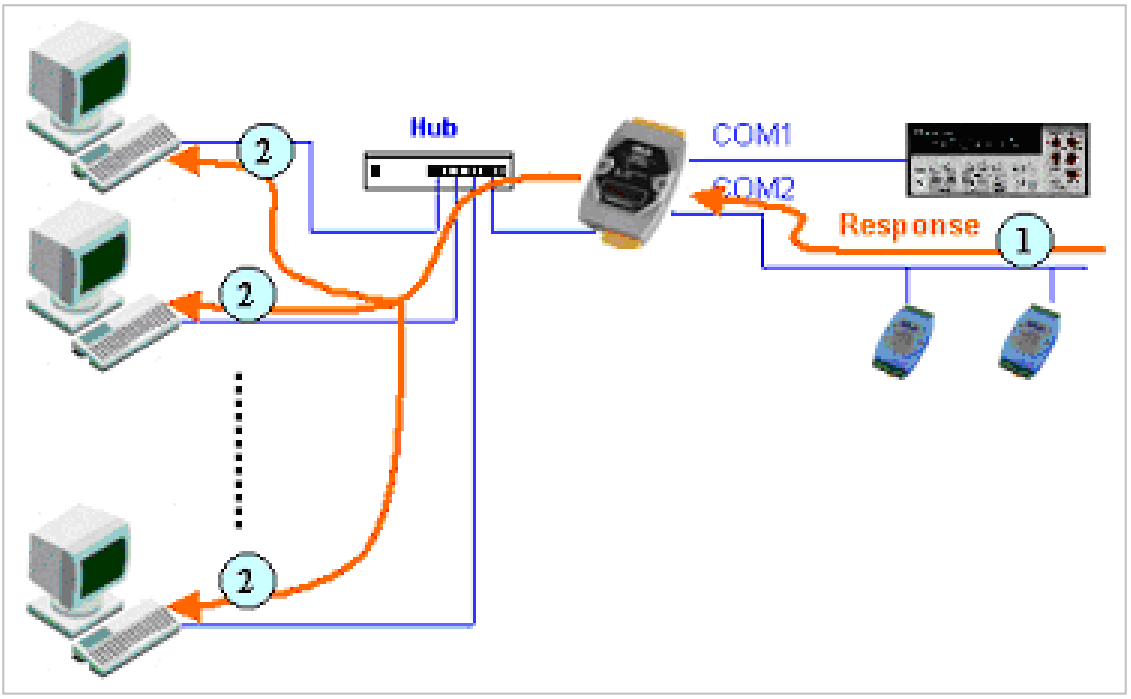
Other Setting	Current	New
Operation Mode	M0(Transparent Mode)	○ M0(Transparent Mode) ○ M1(Slave Mode)

M0: Transparent Mode (Multi-echo mode)

Condition 1: One client sends a request to the PDS-700/DS-700 module to access each device. The PDS-700/DS-700 module echoes the data from each device to each connected client

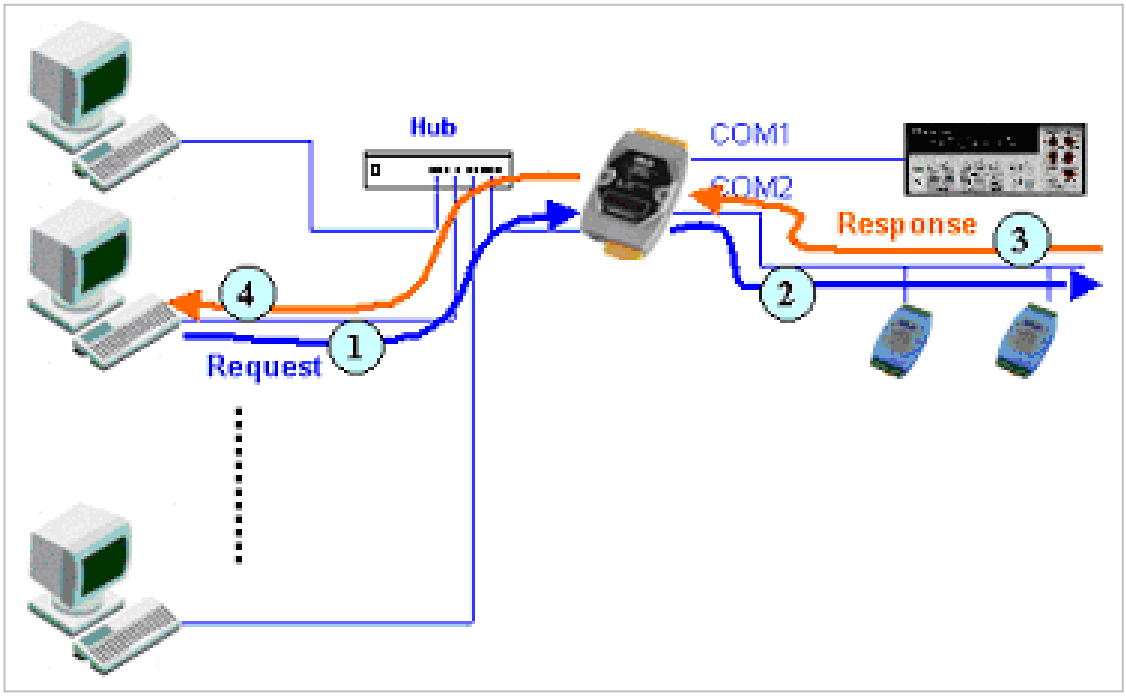


Condition 2: No clients send any requests to the PDS-700/DS-700 module. The PDS-700/DS-700 module echoes data from the devices to each connected client.

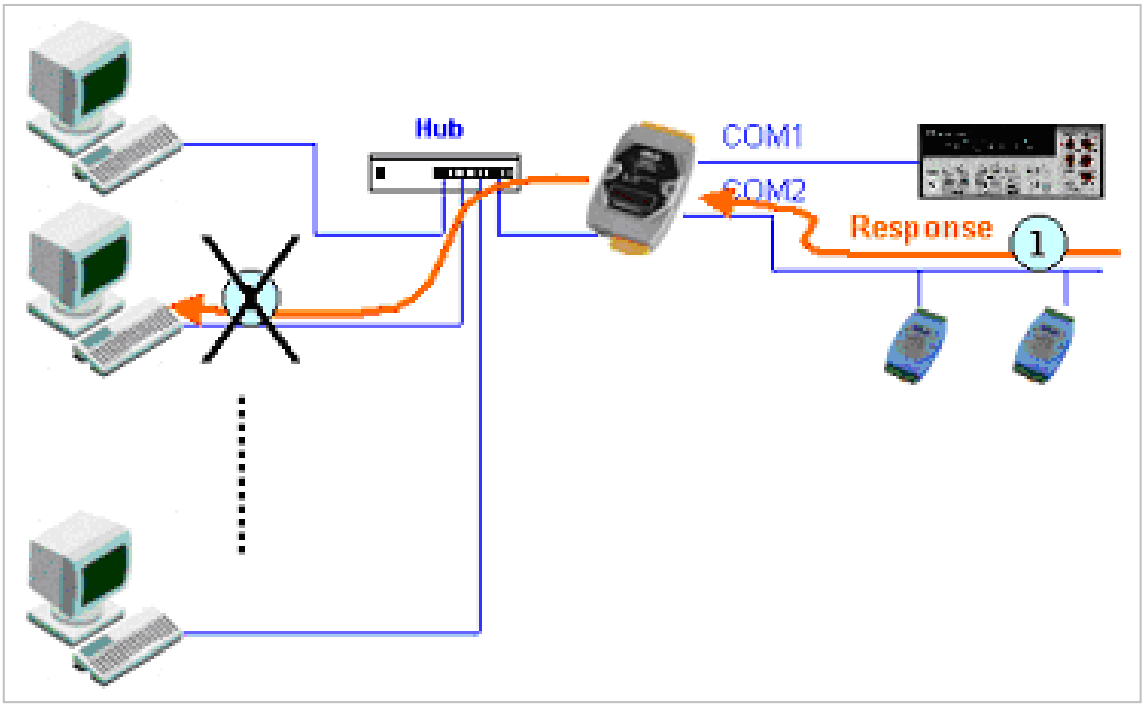


M1: Slave Mode (Single-echo mode)

Condition 1: One client sends a request to the PDS-700/DS-700 module to access the other devices. The PDS-700/DS-700 module echoes data from the devices to the client that requested the service.

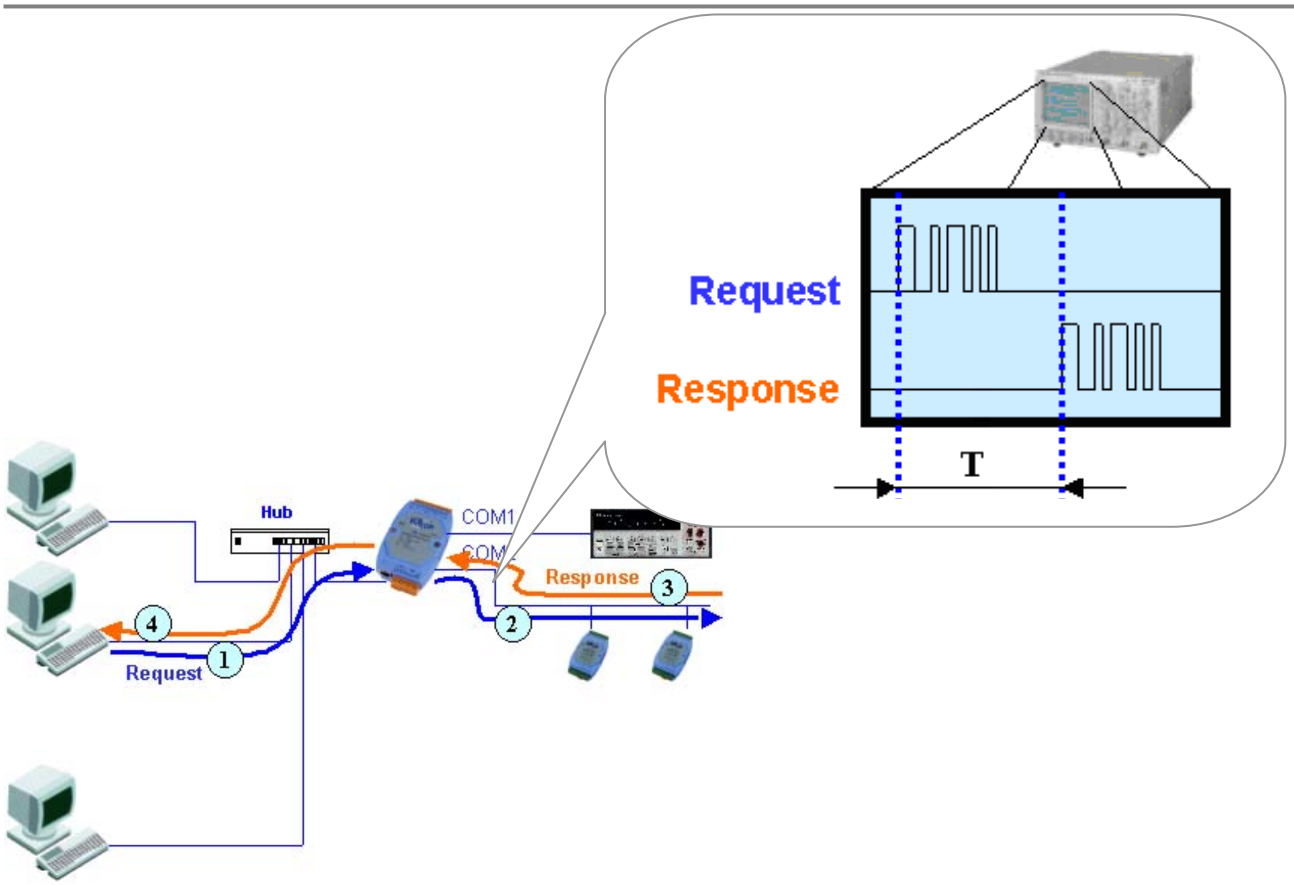


Condition 2: No clients send any requests to the PDS-700/DS-700 module. The PDS-700/DS-700 module doesn't echo any data from the devices to any client.

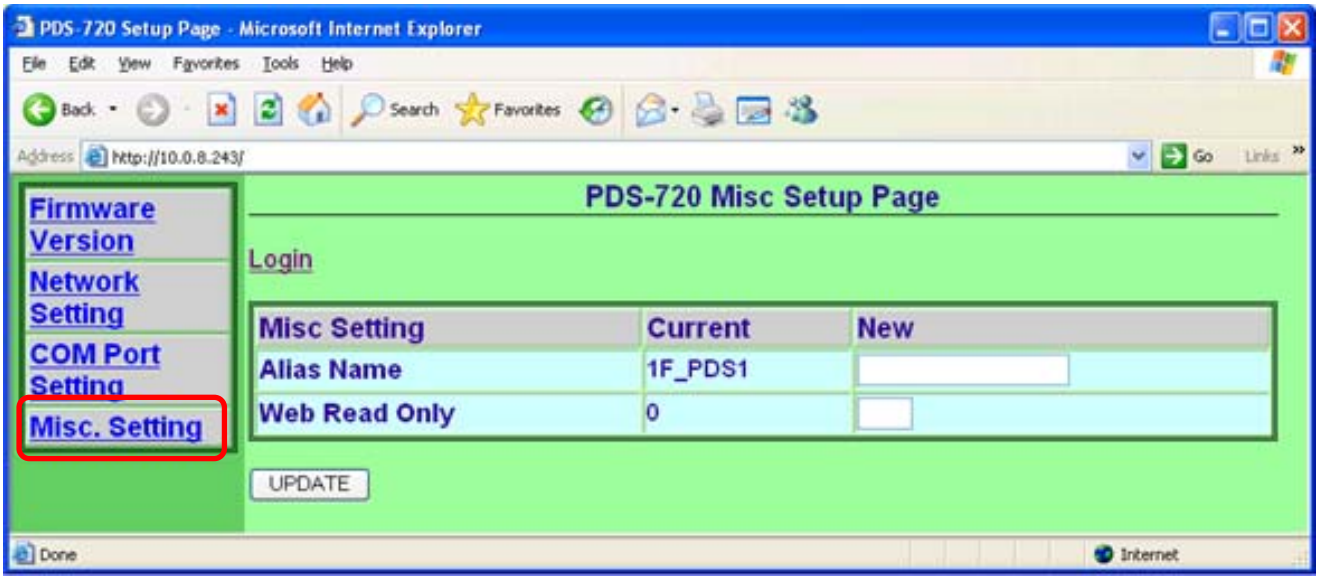


In M1, the slave mode timeout setting is use to set the waiting time after last character of the request sent to the device. If the device does not respond within the timeout value, the PDS-700/DS-700 module will return a timeout error and process next request.

Other Setting	Current	New
Operation Mode	M1(Slave Mode)	○ M0(Transparent Mode) ○ M1(Slave Mode)
Slave Mode Timeout(ms)	100	


Request
Response
T
Hub
COM1
COM
Response
3
2
4
1
Request

5.5. Miscellaneous settings

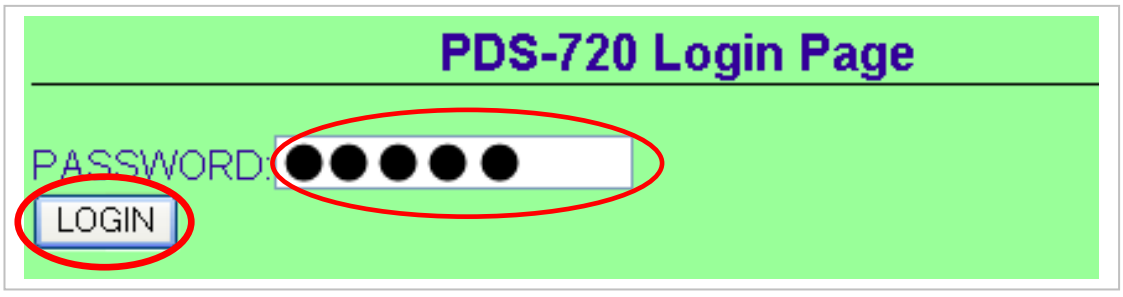


- **Alias Name**: allocates an alias to the PDS-700/DS-700 module.
- **Web Read Only**: 0 = disabled, 1 = enabled

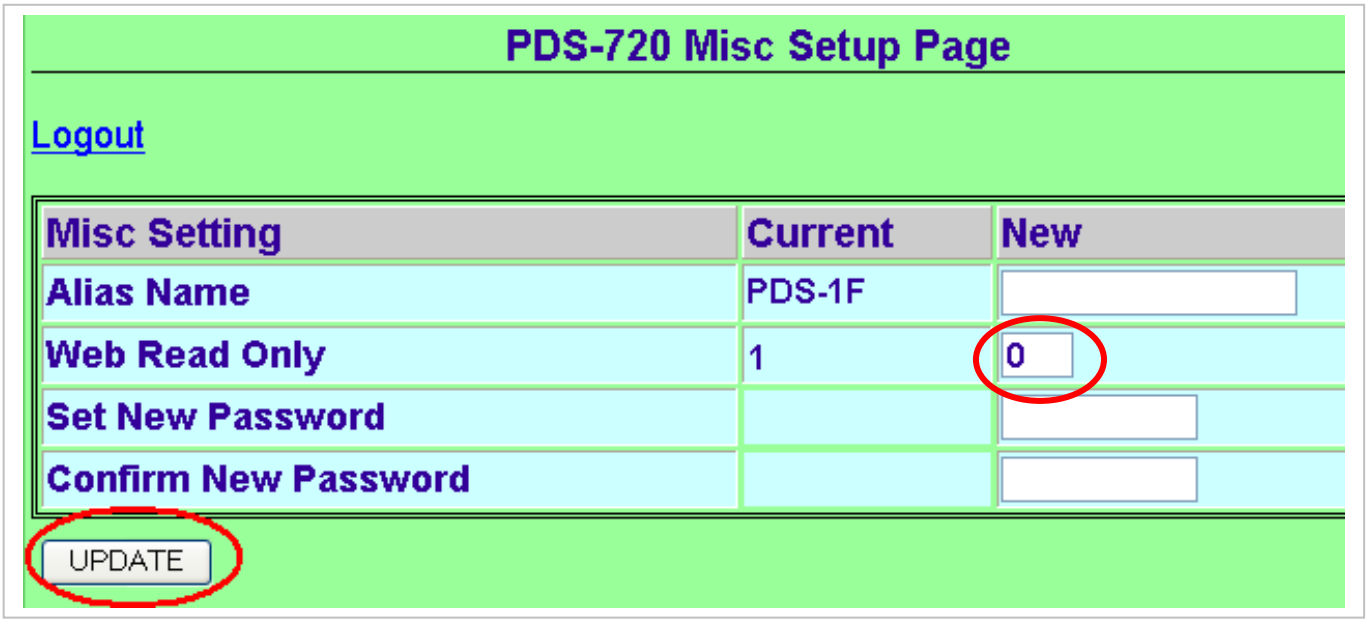
*If the "**Web Read Only**" properly is set to 1, enabled, the web server will **not** be able to save any new configurations to the PDS-700/DS-700 module. To disable the "**Web Read Only**" property, refer to the information below.*

- **Login**: used to disable the "**Web Read Only**" property or to set a new password.

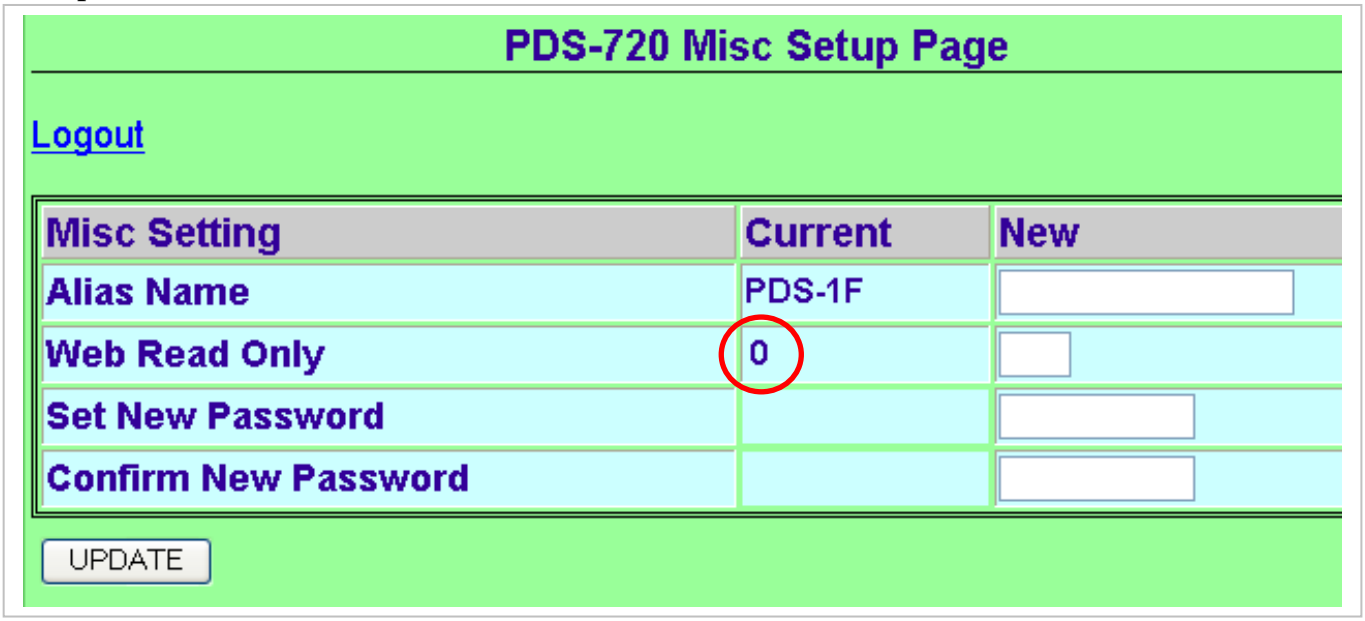
1. Enter the password (default is **admin**) and click the "**LOGIN**" button to proceed to the settings page.



2. Set the new "**Web Read Only**" properly = 0 and click the "**UPDATE**" button.



3. Check that the current the "**Web Read Only**" = 0 and then click "**Logout**" to complete the operation.



4. User can restore PDS-700/DS-700 password to default value "admin" by using "config=RESET" console command (refer to section Console/Telnet Commands List). This command sets most configurations of PDS-700/DS-700 to factory setting. It requires rebooting the PDS-700/DS-700 for loading new configuration (includes default password).

6. Virtual I/O

PDS-700 series modules provide digital I/O lines, including PDS-721/721D, PDS-732/732D, PDS-734/734D, PDS-743/743D, PDS-762/762D. The DI is 0 ~ 30 V_{DC} wide range Digital Input, while the DO is 30 V/100 mA (max.), current sink, open collector digital output. These digital I/O lines can be used to control relays, actuators, switches, etc.

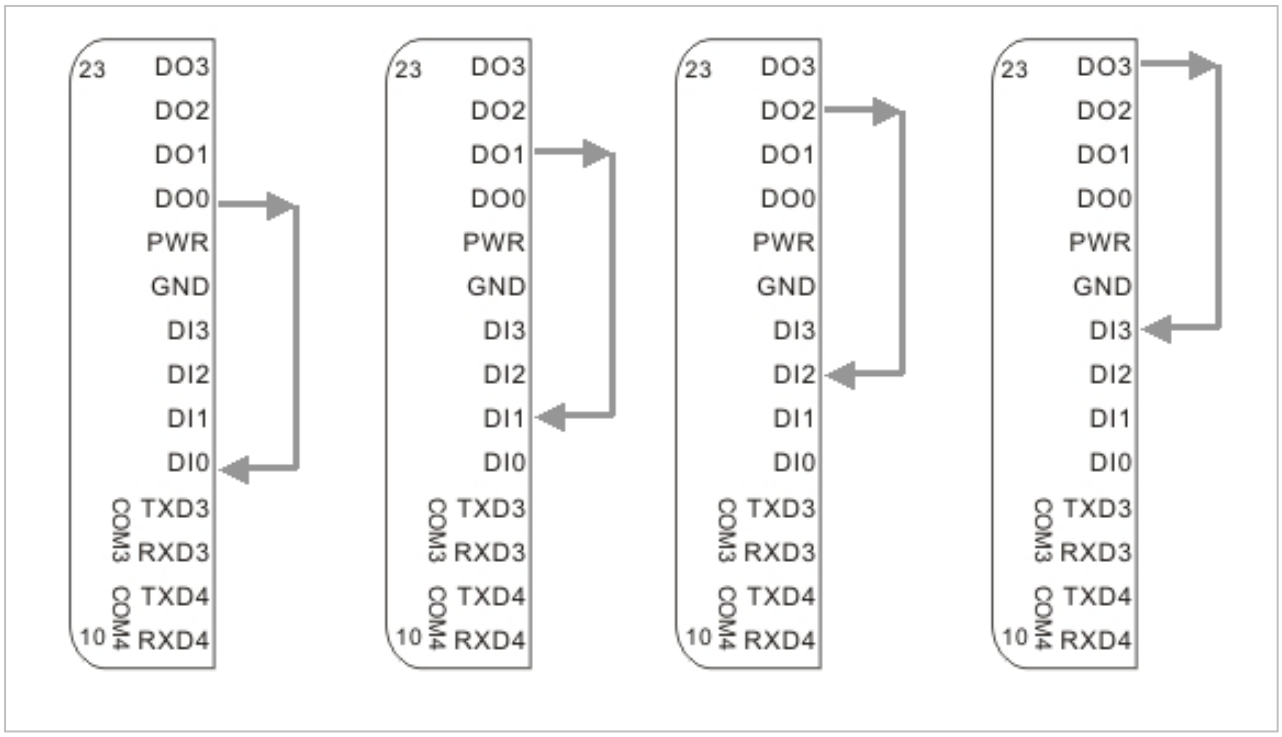
6.1. Testing the Virtual I/O

1. Connect the PDS-700 module to the Ethernet, finalize the configuration setup procedure and complete the Virtual COM test, as described in Chapter 4.

2. Power-on the PDS-700 module.

3. Connect the DO (n) to the DI (n).

For example, the PDS-734 with a 4-port DI/DO

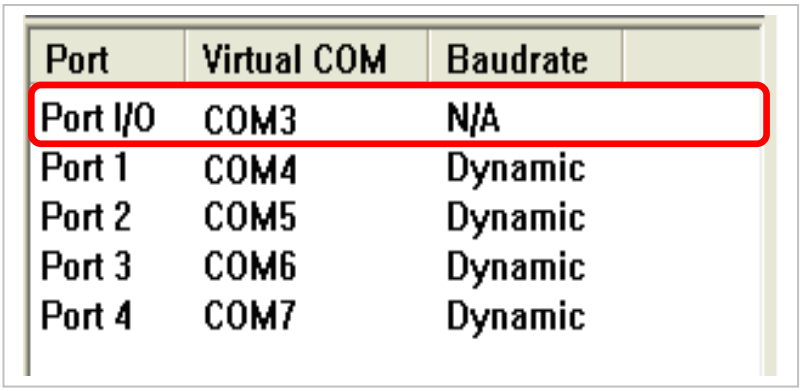


Connect DO 0 to DI 0, DO 1 to DI 1, DO 2 to DI 2 and DO 3 to DI 3.

4. Install the DCON Utility v4.5.0 (or later).
The DCON Utility is located at:
CD:\Napdos\driver\dcon_utility
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_utility/setup/

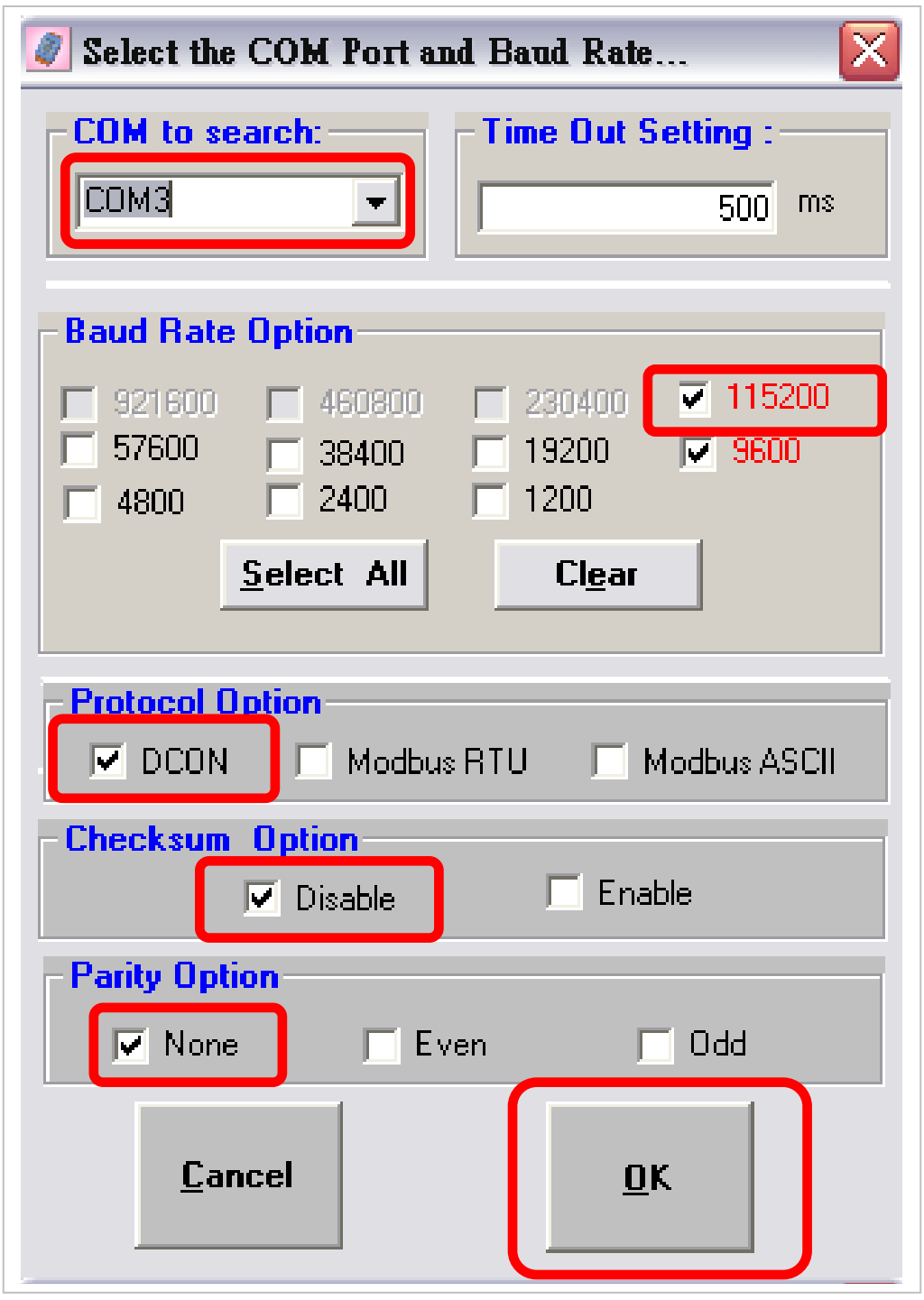
5. Run the DCON Utility, and click the “COM Port” option on the toolbar

6. Check the Virtual COM Port number shown in the Port I/O field in the VxComm Utility.(Refer to Chapter 4 for more details)



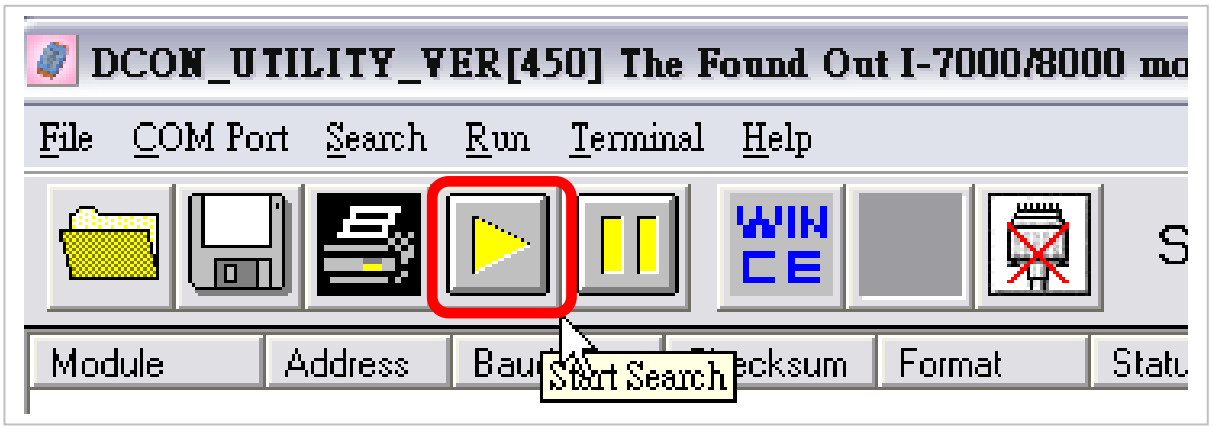
Port	Virtual COM	Baudrate
Port I/O	COM3	N/A
Port 1	COM4	Dynamic
Port 2	COM5	Dynamic
Port 3	COM6	Dynamic
Port 4	COM7	Dynamic

7. Select the Virtual COM Port number. Check 115200 as the Baud Rate, DCON as the protocol, checksum disabled, parity as none, and then click the “OK” button.

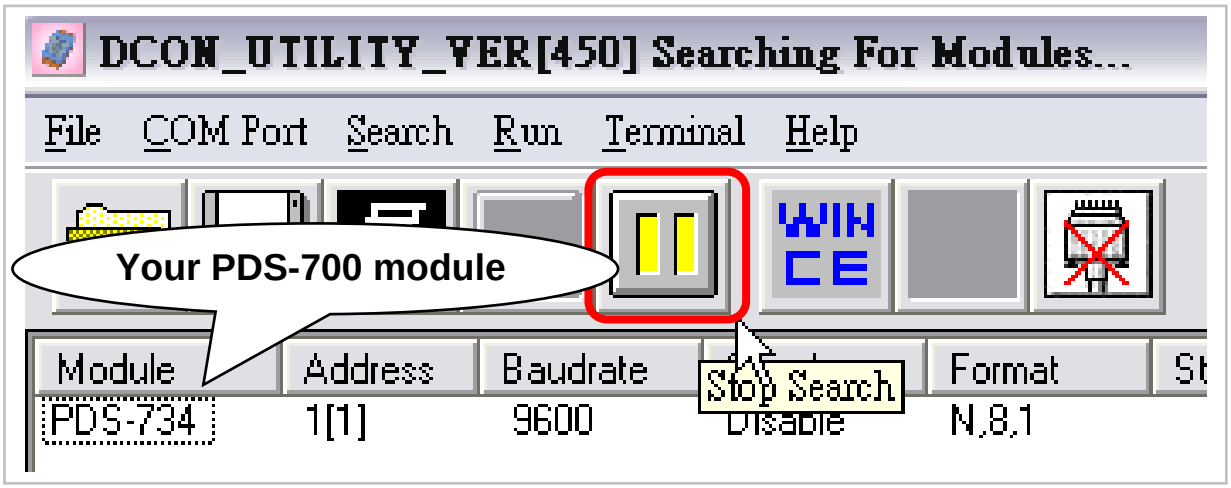


*If your PDS-700 is not equipped with digital I/O lines, the DCON Utility will return an “**Open COM error!**” message.*

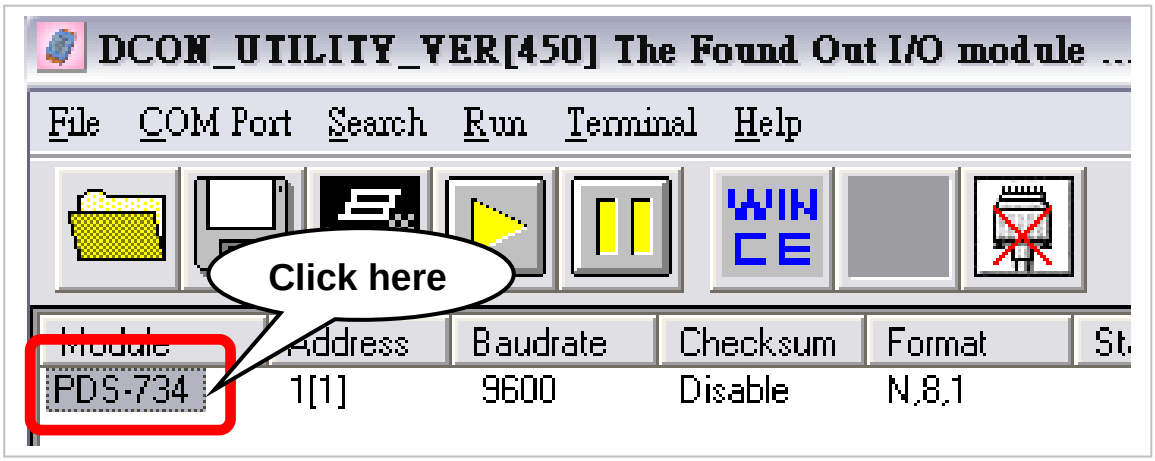
8. Click the button to start searching for the PDS-700 module


DCON_UTILITY_VER[450] The Found Out I-7000/8000 mo
File COM Port Search Run Terminal Help
Module Address Format
Start Search

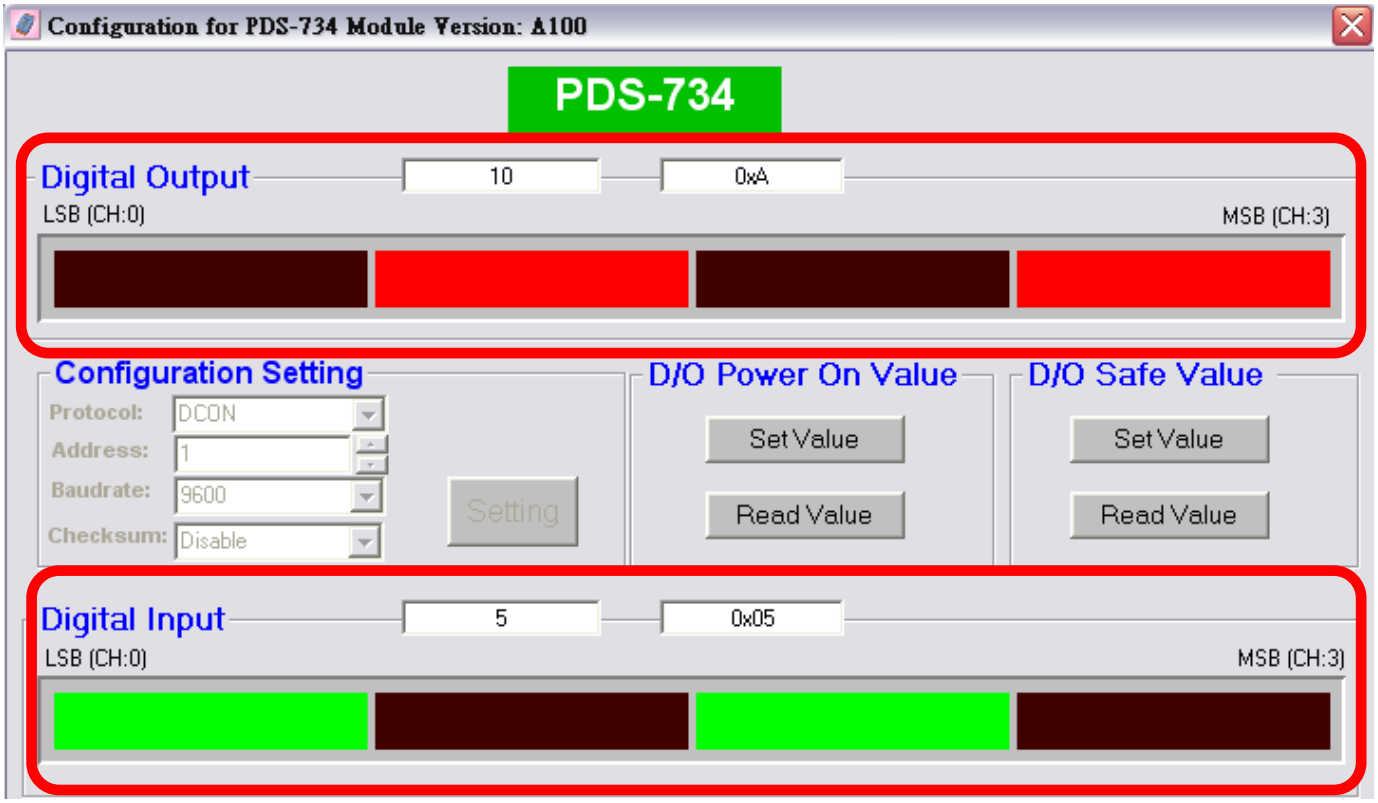
9. When the PDS-700 module is found and is displayed in the DCON Utility, click the button to stop the search


DCON_UTILITY_VER[450] Searching For Modules...
File COM Port Search Run Terminal Help
Your PDS-700 module
Module Address Baudrate Format
PDS-734 1[1] 9600 N,8,1
Stop Search

10. Click on the name of your PDS-700 module.


DCON_UTILITY_VER[450] The Found Out I/O module ...
File COM Port Search Run Terminal Help
Click here
Address Baudrate Checksum Format
PDS-734 1[1] 9600 Disable N,8,1

11. Click the "**Digital Output**" icon to change the high/low status of the DO.



Since all DI lines are connected to DO lines, the DI read value will be 0 when the DO sends a high state, where as the DI read value will be 1.

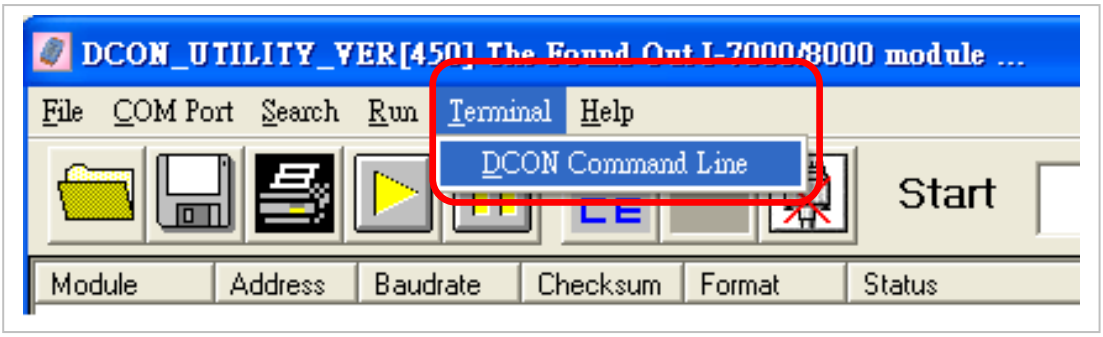
6.2. Virtual I/O Commands Test

The DCON protocol is a request/reply communication protocol; it defines a simple ASCII format protocol, such as $AAN, $AASi6 and #AAN, etc. used to access the PDS-700 and I-7000/8000/87K series I/O modules.

The Virtual I/O command sets are part of the DCON protocol used to access the digital I/O lines of the PDS-700 from the virtualized COM Port mapped to the I/O port. Only PDS-700 modules equipped with digital I/O lines will respond to DCON requests.

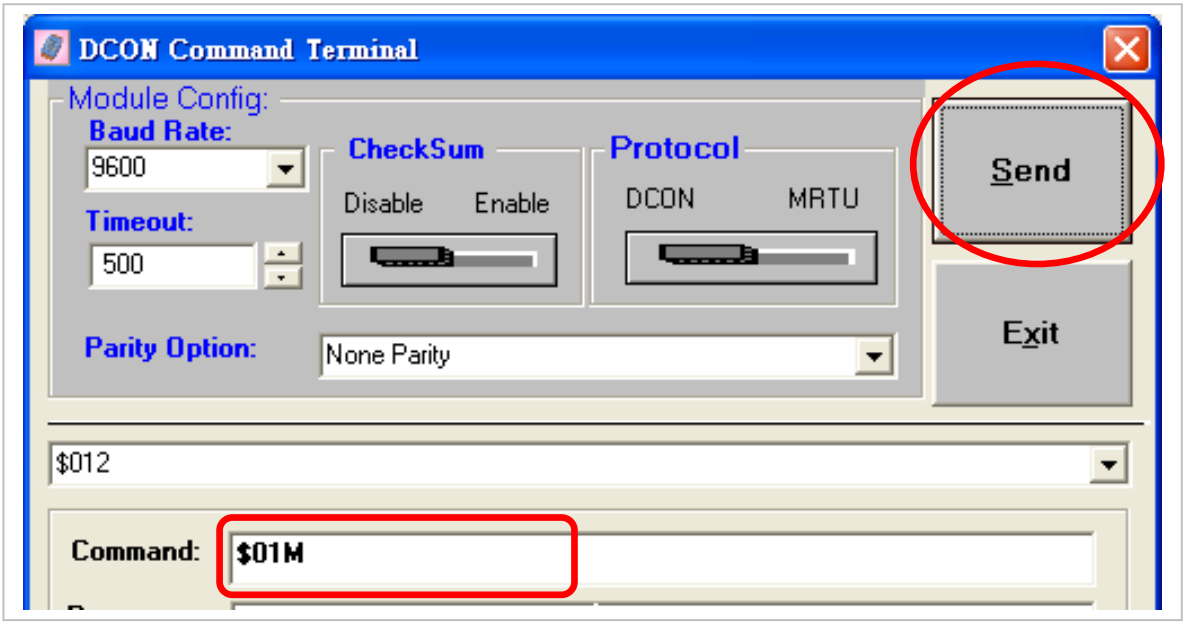
The DCON Utility can be used to test the Virtual I/O commands:
(The DCON command sets are introduced in Chapter 7)

1. Select “**Terminal**” >> “**DCON Command Line**” from the DCON Utility menu.

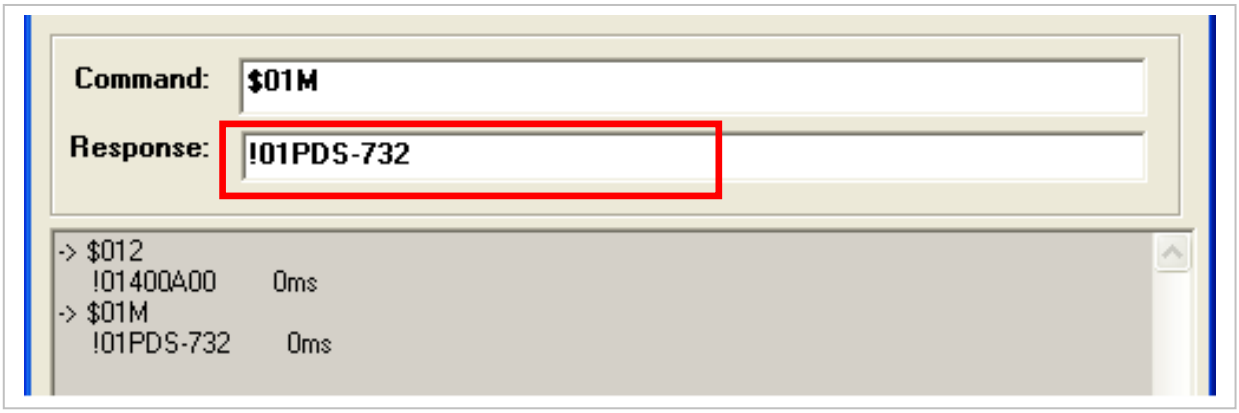


2. Type the Virtual I/O command in the command column and click the “**Send**” button to send the command.

For example, the command $01M is used to read the module name.



3. Receive a response from the PDS-700 module that the command was sent successfully.



6.3. Programming on a PC client

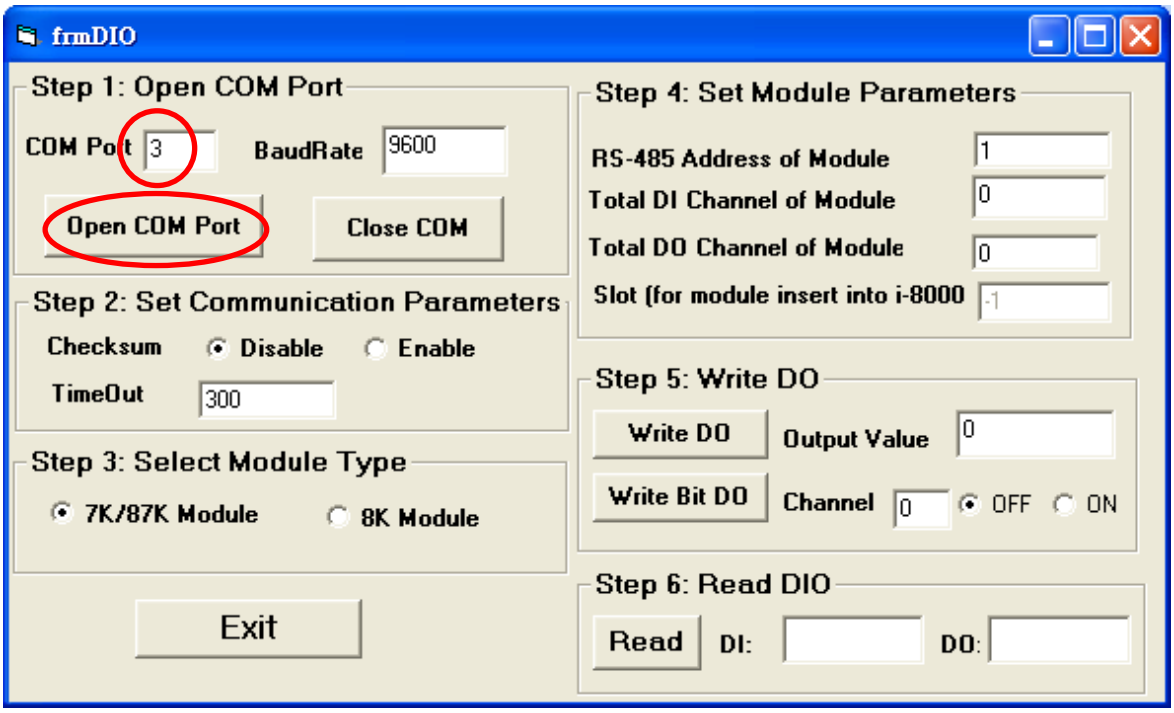
The General DCON Application Programming Interface kit is a set of DLL (lib) functions designed to run on Windows 98/2000/XP that allow access to remote I/O modules such as the PDS-700, I-7000, I-8000 and I-87k series.

The General DCON API kit is located at:

- CD:\ napdos\ driver\ dcon_dll_new\
- ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_dll_new/

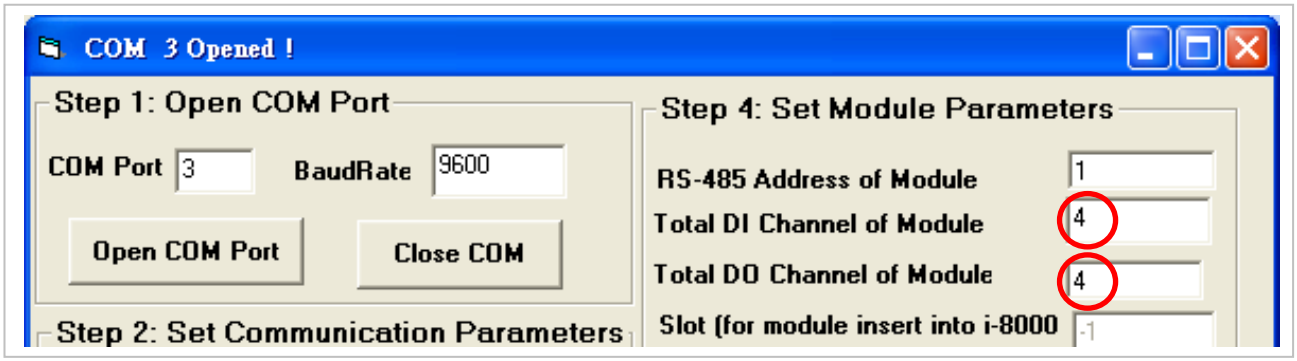
The General DCON API kit provides VC and VB drivers, VB demos and a document called "**dcon_fun_user_manual.pdf**". Only the DIO demo that can be found in the dcon_dll_new\demo\vb6 folder supports PDS-700 series modules. The following steps can be used to test the general DCON API kit with the DIO demo programs.

To run the DIO demo, VB6 must first be installed on the PC.
1. Double click "**prjdio.vbp**" to open the DIO project.
2. Run the demo.
3. Set the Virtual COM Port number of the PDS-700 and click the "**Open COM Port**" button.

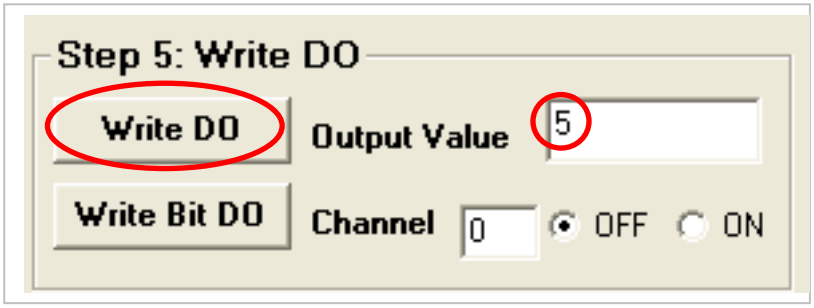


The response "**COM n Opened!**" will be shown on the title bar.

4. Set the total number of DI and DO channels on your PDS-700 module. For instance, the PDS-732 is equipped with 4 DI channels and 4 DO channels.


COM 3 Opened !
Step 1: Open COM Port
COM Port 3
BaudRate 9600
Open COM Port
Close COM
Step 2: Set Communication Parameters
Step 4: Set Module Parameters
RS-485 Address of Module 1
Total DI Channel of Module 4
Total DO Channel of Module 4
Slot (for module insert into i-8000 -1

5. Set the Output value and then click the "**Write DO**" button to transmit the data.



6. Click the "**Read**" button to retrieve the DI data and read the DO data.

7. Press the "**Exit**" button to exit the program.

The functions in the General DCON API kit can be used to access the I/O lines on the PDS-700 module:

Categorization	Dll and lib used	Call condition
Starting function: **Open_Com()**	Uart.dll Uart.lib	Called once when the program starts.
I/O functions **DCON_Write_DO()** **DCON_Write_DO_Bit()** **DCON_Read_DIO()**	dcon_pc.dll dcon_pc.lib	Calls the I/O functions for requirements
Communication **Send_Receive_Cmd()**	Uart.dll Uart.lib	Calls the communication functions for requirements
Ending function **Close_Com()**	Uart.dll Uart.lib	Called once before the program exits.

```
// DO program demo on a PC client
void CManual1Dlg::OnOpen_Com()
{
    Open_Com(3,115200,8,0,1);
    //COM Port: 3, Baud Rate:115200, Data Bit:8, Parity Bit: 0, Stop Bit: 1
}

void CManual1Dlg::OnClose_Com()
{
   Close_Com(3);  }

void CManual1Dlg::OnDigital_Out()
{
  iRet=DCON_Write_DO(3,1,-1,4,iDO_value,0,100);
    //COM Port: 3, Address: 1, Slot: -1, total channel count:4, DO data,
    //Checksum: disabled, Timeout: 100 (ms)
}
```

Open_Com()

Description: This function opens the specified COM Port.
Syntax: Open_Com(unsigned char cPort,
DWORD dwBaudrate,
char cData,
char cParity,
char cStop);

Return:

0	no error.
Others	error codes.

Parameters:

cPort	COM Port number (1 ~ 255)
dwBaudrate	Communication Baud Rate
cData	Data bit, (8 for PDS-700)
cParity	0 = No parity
cStop	0 = 1 Stop bit

Close_Com ()

Description: This function closes the specified COM Port.
Syntax: Close_Com(unsigned char cPort)

Return:

0	no error.
Others	error codes.

Parameters:

cPort	COM Port number (1 ~ 255)

Send_Receive_Cmd ()

Description: This function sends a DCON command string and receives the response.
Syntax: Send_Receive_Cmd(unsigned char cPort,
char szCmd[],
char szResult[],
WORD wTimeOut,
WORD wChksum,
WORD *wT)

Return:

0	no error
Others	error codes

Parameters:

cPort	COM Port number (1 ~ 255)
szCmd[]	the send string, 1024 bytes maximum, without a zero (0x0D) character
szResult[]	the result string recevied, 1024 bytes maximum, with one zero or 0x0D terminal character
wTimeOut	timeout for receiving the result string. Unit: ms
wChksum	0 ==> add one 0x0D byte to the end of the szCmd <>0 ==> add two check sum bytes and one 0x0D byte to the end of the szCmd
***wT**	return a reference number to identify the performance

DCON_Write_DO ()

Description: This function sends a group of digital output data to the PDS-700 module.
Syntax: DCON_Write_DO(unsigned char cComPort,
short iAddress,
short iSlot,
short iDO_TotalCh,
unsigned long lDO_Value,
short iCheckSum,
short iTimeOut);

Return:

0	no error
Others	error codes

Parameters:

cComPort	COM Port number, 1 ~ 255
iAddress	Module address, **1** for the PDS-700 module
iSlot	**–1** for the PDS-700 module
iDO_TotalCh	total DO channel count on the PDS-700 module
lDO_Value	digital output data
iCheckSum	0: disabled or 1: enabled
iTimeout	timeout setting, default = 100 (unit: ms)

DCON_Write_DO_Bit ()

Description: This function sends one bit of digital output data to the PDS-700 module.
Syntax: DCON_Write_DO_Bit(unsigned char cComPort,
short iAddress,
short iSlot,
short iChannel,
short iDO_TotalCh,
short iBitValue,
short iCheckSum,
short iTimeOut);

Return:

0	no error.
Others	error codes.

Parameters:

cComPort	COM Port number, 1 ~ 255
iAddress	Module address, **1** for the PDS-700 module
iSlot	**–1** for the PDS-700 module
iChannel	The digital output channel No.
iDO_TotalCh	total DO channel count on the PDS-700 module
iBitValue	**1** bit of digital output data, 0 = off, 1 = on
iCheckSum	0: disabled or 1: enabled
iTimeout	timeout setting, normal = 100, unit: ms

DCON_Read_DIO ()

Description: This function reads the DO and DI lines status.
Syntax: DCON_Read_DIO(unsigned char cComPort,
short iAddress,
short iSlot,
short iDI_TotalCh,
short iDO_TotalCh,
short iCheckSum,
short iTimeOut,
unsigned long * lDI_Value,
unsigned long * lDO_Value,
char * cDI_BitValue,
char * cDO_BitValue);

Return:

0	no error
Others	error codes

Input Parameter:

cComPort	COM Port number, 1 ~ 255
iAddress	Module address, **1** for the PDS-700 module
iSlot	**–1** for the PDS-700
iDI_TotalCh	total DI channel count on the PDS-700 module
iDO_TotalCh	total DO channel count on the PDS-700 module
iCheckSum	0: disabled or 1: enabled
iTimeout	Timeout setting, normal = 100, unit: ms
iDI_Value	read digital input data
iDO_Value	read digital output data
cDI_BitValue	read digital input data, Boolean array format
cDO_BitValue	read digital output data, Boolean array format

7. Virtual I/O Commands

Command Format: **(Leading)(Address)(Command)[CHK](cr)**
Response Format: **(Leading)(Address)(Data)[CHK](cr)**

(Address)	2-character, "**01**" for PDS-700 virtual I/O
[CHK]	2-character checksum, no checksum for PDS-700 virtual I/O
(cr)	carriage return (0x0D) for ending character of command

Checksum Calculation:
1. Calculate the ASCII sum of all characters in the command (or response) string except for the return character (cr).
2. Mask the sum of the string with 0ffh

Example:
Command string: $012 (cr)
Sum of the string = '$' + '0' + '1' + '2' = 24 h + 30 h + 31 h + 32 h = B7 h
The checksum is B7 h, and **[CHK]** ="B7".
Command string with checksum: $012B7 (cr)

Response string: !01300600 (cr)
Sum of the string = '!' + '0' + '1' + '3' + '0' + '0' + '6' + '0' + '0' = 21 h + 30 h + 31 h + 33 h + 30 h + 30 h + 36 h + 30 h + 30 h = 1AB h
The checksum is AB h, and **[CHK]** ="AB".
Response string with checksum: !01300600AB (cr)

General Command Sets			
Command	Response	Description	Section
$AA5	!AAS	Reads the Reset Status	7.1
$AA6	!AA(Data)	Reads the Digital I/O Status	7.2
$AAC	!AA	Clears the Latched Digital Input	7.3
$AACn	!AA	Clears the Digital Input Count	7.4
$AAGCN	>AA(Data)	Retrieves the I/O Channel Count	7.5
$AALs	!(Data)	Reads the Latched DI	7.6
$AAF	!AA(Data)	Reads the Firmware Version	7.7
$AAM	!AA(Data)	Reads the Module Name	7.8
@AA	>(Data)	Reads the Digital Input/Output Status	7.9
@AA(Data)	>	Sets the Digital Output	7.10
#AAn	!AA(Data)	Reads the DI counter	7.11
#AA00dd	>	Sets the Multi-channel Output	7.12
#AA1ndd	>	Sets the Single Channel Output	7.13

Host Watchdog Command Sets			
Command	Response	Description	Section
~**	No Reponse	Host is OK	7.14
~AA0	!AASS	Reads the Module Status	7.15
~AA1	!AA	Reset Module Status	7.16
~AA2	!AAeff	Reads the Host Watchdog Timeout Value	7.17
~AA3eff	!AA	Sets the Host Watchdog Timeout Value	7.18
~AA4P	!AA(Data)	Reads the Power-on Value for D/O	7.19
~AA4S	!AA(Data)	Reads the Safe Value for the D/O	7.20
~AA5P	!AA	Sets the Power-on Value for the D/O	7.21
~AA5S	!AA	Sets the Safe Value for the D/O	7.22

Note: All commands require a carriage return (0x0D) for ending character.

7.1. $AA5

Description: This function reads the reset status

Syntax: $AA5[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
5	A command for reading the status

Response: Valid Command: **!AAs[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*There will be no response if there is a syntax error or a communication error.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
s	The reset status: 1 = The Module has been reset, and the status was cleared to 0 after using this command. 0 = the module has never been reset

Example:

Command	Response
$015	!011
1. Reads the reset status. Returns read for the first time	
$015	!010
1. Reads the reset status. Returns that no reset has occurred	

Related Topics:

Sec. Reset Status

7.2. $AA6

Description: This function reads the status of the digital I/O channels

Syntax: $AA6[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
6	A command for reading the digital I/O status

Response: Valid Command: **!ddff00[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A Syntax error or a communication error will result in no response.

!	A delimiter for valid command
?	A delimiter for invalid command
AA	The address of the module (01 only for PDS-700)
dd	The current status of the digital output channels
ff	The status of the digital input channel

Example:

Command	Response
$016	!0F0000
1. Reads the digital input/output status. Returns 0F00; 2. The status of digital output channels 3 to 0 is set as on. 3. The status of all digital input channels is set to off.	

Related Commands:

Sec.7.9 @AA

7.3. $AAC

Description: This function clears the latched status of the digital Input

Syntax: $AAC[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
C	A command for clearing latched digital inputs

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*Syntax error or a communication error will result in no response.

!	A delimiter for valid command
?	A delimiter for invalid command
AA	The address of the module (01 only for PDS-700)

Example:

Command	Response
$01L0	!FFFF00
1. Reads the latch-low data. Returns FFFF.	
$01C	!01
1. Clears the latched digital inputs. Returns success.	
$01L0	!000000
1. Reads the latch-low data. Returns 0000.	

Related Commands:

Sec.7.6 $AALs

7.4. $AACn

Description: This function clears the digital input counter

Syntax: $AACn[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
C	A command for clearing the digital input count
n	The digital input channel number

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)

Example:

Command	Response
#010	!0100123
1. Reads the counter value on digital input channel 0. Returns 123.	
$01C0	!01
1. Clears the counter value on digital input channel 0. Returns success.	
#010	!0100000
1. Reads the counter value on digital input channel 0. Returns 0.	

Related Commands:

Sec.7.11 #AAn

7.5. $AAGCN

Description: This function reads the digital input/output channel count

Syntax: $AAGCN[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
GCN	A command for reading the digital input/output channel count

Response: Valid Command: **>DINxxDONxx[CHK](cr)**

Valid Command: **>DONxx[CHK](cr)** (DO only)

Invalid Command: **?AA[CHK](cr)**

* A Syntax error or a communication error will result in no response.

>	A delimiter for valid command
?	A delimiter for invalid command
AA	The address of the module (01 only for PDS-700)
DINxx	DIN: The digital input channel xx : The total channel count
DONxx	DON: The digital output channel xx : The total channel count

Example:

Command	Response
$01GCN	>DIN01DON02
1. Reads the total I/O channel count for the module. Returns that the module is equipped with 1 digital input channel and 2 digital output channels.	

7.6. $AALs

Description: This function reads the latched digital Input

Syntax: $AALs[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
L	A command for reading the latched digital input data
s	1 = read latch-high data 0 = read latch-low data

Response: Valid Command: **!(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The read data 1 = the input channel is latched 0 = the input channel is not latched

Example:

Command	Response
$01L1	!FF0000
Read the latch-high data. Returns FF00 meaning that, channel 7 to 0 are all latched. (For modules with a DI channel count between 5 and 8)	
$01L1	!F00000
1. Reads the latch-high data. Returns FF00 meaning that, channels 3 to 0 are all latched. (For modules with a DI channel count between 1 and 4)	

Related Commands:

Sec.7.3 $AAC

7.7. $AAF

Description: This function reads the firmware version details

Syntax: $AAF[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
F	A command for reading the firmware version details

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A Syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The firmware version information

Example:

Command	Response
$01F	!01A1.00
1. Read the firmware version details. Returns version No. A1.00	

7.8. $AAM

Description: This function reads the module name

Syntax: $AAM[CHK](cr)

$	A delimiter character
AA	The address of the module (01 only for PDS-700)
M	A command for reading the module name

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The name of module

Example:

Command	Response
$01M	!01PDS-721
1. Reads the module name. Returns the name PDS-721	

7.9. @AA

Description: This function reads the status of the digital input/output

Syntax: @AA[CHK](cr)

@	A delimiter character
AA	The address of the module (01 only for PDS-700)

Response: Valid Command: **>(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

>	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The status of the DIO

Example:

Command	Response
@01	>050F

1. Read the status of the DIO. Returns 050F.
2. The first two bytes indicate the status of the DO. 05 means that channel 0 and channel 2 are 1, and the other channels are 0.
3. The last two bytes indicate the status of the DI. 0F means that all 4 channels read are 1.

7.10. @AA(Data)

Description: This function sets the digital output

Syntax: @AA(Data)[CHK](cr)

@	A delimiter character
AA	The address of the module (01 only for PDS-700)
(Data)	The output value
1. (Data) is one character for output channels less than 4 For the PDS-762/762D modules, this will be from 0 to 3 For the PDS-732/732D/734/734D/743/743D modules, this will be from 0 to F 2. (Data) is two characters for output channels less than 8 For the PDS-721/721D modules, this will be from 00 to 7F	

Response: Valid Command: **>[CHK](cr)**

Invalid Command: **?[CHK](cr)**

Ignore Command: **![CHK](cr)**

*A syntax error or a communication error will result in no response.

>	A delimiter for a valid command
?	A delimiter for an invalid command
!	A delimiter for an ignore command, meaning that the module is in Host Watchdog Timeout Mode, and the output is set to safe value.

Example:

Command	Response
@013	>
Output value 3, Returns success	
@011F	!
Output value 1F. Return that the module is in Host Watchdog Timeout Mode and the output command has been ignored.	

7.11. #AAn

Description: This function reads digital input counter from channel n

Syntax: #AAn[CHK](cr)

#	A delimiter character
AA	The address of the module (01 only for PDS-700)
n	The digital channel number (from 0)

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The digital input counter value in decimal format from 00000 to 65535

Example:

Command	Response
#012	!0100103
Read the digital input counter of channel 2. Returns the value 103	
#013	?01
Read the digital input counter of channel 3. Returns an error including that the channel is not available	

Related Command:

Sec.7.4 $AACn

7.12. #AA00dd

Description: This function sets the multi-channel Output

Syntax: #AA00dd[CHK](cr)

#	A delimiter character
AA	The address of the module (01 only for PDS-700)
00	A command used to set multi-channel output
dd	The output value

Response: Valid Command: **>[CHK](cr)**

Invalid Command: **?[CHK](cr)**

Ignored Command: **![CHK](cr)**

*A syntax error or a communication error will result in no response.

>	A delimiter for a valid command
?	A delimiter for an invalid command
!	A delimiter for an ignore command, meaning that the module is in Host Watchdog Timeout Mode, and the output is set to safe values

Example:

Command	Response
#01000F	>
Set the digital output of channel 3 to 0 as on. Returns success.	
#010005	!
Set the digital output of channel 0 and 2 as on. Returns that the module is in Host Watchdog Timeout Mode, and the output was been set to safe values.	

Related Commands:

Sec7.10 @AA(Data), Sec.7.15 ~AA0, Sec.7.16 ~AA1

7.13. #AA1ndd

Description: This function sets the output of a single channel

Syntax: #AA1ndd[CHK](cr)

#	A delimiter character
AA	The address of the module (01 only for PDS-700)
1n	The command used to set the output of a single channel. n is the digital output channel number.
dd	00: sets the digital output channel to off 01: sets the digital output channel to on

Response: Valid Command: **>[CHK](cr)**

Invalid Command: **?[CHK](cr)**

Ignored Command: **![CHK](cr)**

*A syntax error or a communication error will result in no response.

>	A delimiter for a valid command
?	A delimiter for an invalid command
!	A delimiter for an ignore command, meaning that the module is in Host Watchdog Timeout Mode, and the output is set to safe values

Example:

Command	Response
#011201	>
Set the digital output of channel 2 to on. Returns success.	

Related Commands:

Sec7.10 @AA(Data), Sec.7.15 ~AA0, Sec.7.16 ~AA1

7.14. ~**

Description: This function is used to let other modules know that the Host is OK

Syntax: ~**[CHK](cr)

~	A delimiter character
**	The command for all modules

Response: No response

Example:

Command	Response
~**	No response

Related Commands:

Sec.7.15 ~AA0, Sec.7.16 ~AA1, Sec.7.17 ~AA2, Sec7.18 ~AA3eff,

Sec.7.19 ~AA4P, Sec.7.20 ~AA4S, Sec.7.21 ~AA5P, Sec.7.22 ~AA5S

7.15. ~AA0

Description: The function reads the status of the Host Watchdog

Syntax: ~AA0[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
0	The command used to read the status of the module

Response: Valid Command: **!AASS[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
SS	The status of the module 00 = The Host watchdog status has been cleared, or no timeout occurred. 04 = The Host Watchdog has been set, timeout occurred. Use command ~AA1 to clear the status that recorded in EEPROM.

Example:

See the ~AA3eff example in Sec 7.18

Related Commands:

Sec.7.15 ~AA0, Sec.7.16 ~AA1, Sec.7.17 ~AA2, Sec.7.18 ~AA3eff, Sec.7.19 ~AA4P, Sec.7.20 ~AA4S, Sec.7.21 ~AA5P, Sec.7.22 ~AA5S

7.16. ~AA1

Description: This function clears the status of the Host Watchdog

Syntax: ~AA1[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
1	The command used to reset the status of the module

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)

Example:

See the ~AA3eff example in Sec. 7.18

Related Commands:

Sec. 7.15 ~AA0, Sec. 7.16 ~AA1, Sec. 7.17 ~AA2, Sec. 7.18 ~AA3eff, Sec. 7.19 ~AA4P, Sec. 7.20 ~AA4S, Sec. 7.21 ~AA5P, Sec. 7.22 ~AA5S

7.17. ~AA2

Description: This function reads the Host Watchdog Timeout Value

Syntax: ~AA2[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
2	The command used to read the Host Watchdog Timeout Value

Response: Valid Command: **!AAeff[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
e	The status of the Host Watchdog, 1 = Enabled, 0 = Disabled
ff	The timeout value in Hex format. The unit is 0.1 seconds 01 = 0.1 seconds FF = 25.5 seconds

Example:

See the ~AA3eff example in Sec. 7.18

Related Commands:

Sec. 7.15 ~AA0, Sec. 7.16 ~AA1, Sec. 7.17 ~AA2, Sec. 7.18 ~AA3eff, Sec. 7.19 ~AA4P, Sec. 7.20 ~AA4S, Sec. 7.21 ~AA5P, Sec. 7.22 ~AA5S

7.18. ~AA3eff

Description: This function sets the Host Watchdog Timeout Value

Syntax: ~AA3eff[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
3	The command used to set the Host Watchdog Timeout Value
e	1 = Enabled, 0 = Disabled
ff	The timeout value, from 01 to FF, the unit is 0.1 second

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)

Example:

Command	Response
~010	!0100
Read the status of the module. Returns the status of the Host Watchdog Timeout has been cleared.	
~013164	!01
Set the status of the Host Watchdog Timeout Value to 10.0 seconds and enable the Host Watchdog. Return Success.	
~012	!01164
Read the Host Watchdog Timeout Value. Returns the Host Watchdog Timeout Value is 10.0 seconds, and the Host Watchdog is enabled.	

~**	No response
If the ~** command is not sent within 10 seconds, the LED on the module will begin to flash. The LED indicates that the status of the Host Watchdog Timeout is set.	
~010	!0104
Read the status of the module. Returns the status of the Host Watchdog Timeout Value is set.	
~012	!01064
Read the Host Watchdog Timeout Value. Returns the Host Watchdog Timeout Value is 10.0 seconds, and the Host Watchdog is disabled.	
~011	!01
Reset the status of the Host Watchdog Timeout. Returns success, and the LED stops flashing.	
~010	!0100
Read the module status. Returns that the status of the Host Watchdog Timeout has been clear.	

Related Commands:

Sec. 7.15 ~AA0, Sec. 7.16 ~AA1, Sec. 7.17 ~AA2, Sec. 7.18 ~AA3eff, Sec. 7.19 ~AA4P, Sec. 7.20 ~AA4S, Sec. 7.21 ~AA5P, Sec. 7.22 ~AA5S

7.19. ~AA4P

Description: This function reads the Power-on Values for the DO

Syntax: ~AA4P[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
4P	The command used to read the power-on value for the DO

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The power-on values

Example:

Command	Response
~014P	!01000F
Read the power-on values. Returns the power-on value 0F	

Related Commands:

Sec. 7.21 ~AA5P

7.20. ~AA4S

Description: This function reads the Safe Values for the DO

Syntax: ~AA4S[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
4S	The command used to read safe values for the DO

Response: Valid Command: **!AA(Data)[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A Syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)
(Data)	The power-on values

Example:

Command	Response
~014S	!01000F
Read the safe values. Returns the power-on value 0F	

Related Commands:

Sec. 7.22 ~AA5S

7.21. ~AA5P

Description: This function sets the Power-on Value for the DO

Syntax: ~AA5P[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
5P	The command used to set the power-on value for the DO

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)

Example:

Command	Response
@0103	>
Output the value 03. Returns success	
~015P	!01
Set the current output status as power-on value, return success.	

Related Commands:

Sec. 7.19 ~AA4P

7.22. ~AA5S

Description: This function sets the Safe Value for the DO

Syntax: ~AA5S[CHK](cr)

~	A delimiter character
AA	The address of the module (01 only for PDS-700)
5S	The command used to set the safe value for the DO

Response: Valid Command: **!AA[CHK](cr)**

Invalid Command: **?AA[CHK](cr)**

*A syntax error or a communication error will result in no response.

!	A delimiter for a valid command
?	A delimiter for an invalid command
AA	The address of the module (01 only for PDS-700)

Example:

Command	Response
@0103	>
Output the value 03. Returns success	
~015S	!01
Set the current output status as the safe value. Returns success.	

Related Commands:

Sec. 7.20 ~AA4S

7.23. Application Notes

Hot Watchdog Status

The Power On Reset or Module Watchdog Reset will return all output settings to Power On Values. The Host Watchdog Timeout will return all output values to Safe Values. Additionally, the status of the Host Watchdog, which can be read using the ~AA0 command, will be recorded as 04, and output commands will be ignored until the status is cleared to 0 by using command ~AA1.

Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit that is used to monitor the operating status of the module. When working in harsh or noisy environments, the module may be interrupted by external signals. The circuit can let the module reboot automatically and to work continues without halt.

The Host Watchdog is a software function that is used to monitor the operating status of the host. Its purpose is to keep PDS-700's output in a safe state when there is network communication problem or host PC halt. If the timeout interval expires, the module will turn all outputs to the predefined Safe Value and prevent unexpected situation from occurring.

The PDS-700 series with Dual Watchdog will make the control system more reliable and stable.

Reset Status

The Reset Status is set when the module is powered on or if it is reset by the Module Watchdog. The status can be cleared by using the Reset Status ($AA5) command. This is useful for checking the operating status of the module. When the Reset Status is set it means that the module has been reset and the output can be changed to the Power On Value. When the Reset Status is clear it means the module was not been reset, and the output was not changed.

Digital Output

The output status of the module has three different conditions:

<1> Safe Value: If the Host Watchdog Timeout status is set, the output is set to the Safe Value. If the module receives an output command, such as @AA(Data) or #AABBDD, the module will ignore the command and return '!', and will not change the output to the output command value. The Host Watchdog Timeout status is set and store into EEPROM while the Host Watchdog Timeout interval has expired, and can only be cleared by setting the command ~AA1.

If user needs to change the output, the Host Watchdog Timeout status needs to be cleared first, and an output command need to be sent to change the output to the desired value.

<2> PowerOn Value: Once the module is reset, and the Host Watchdog Timeout status has been cleared, the output of the module is set to a predefined PowerOn Value.

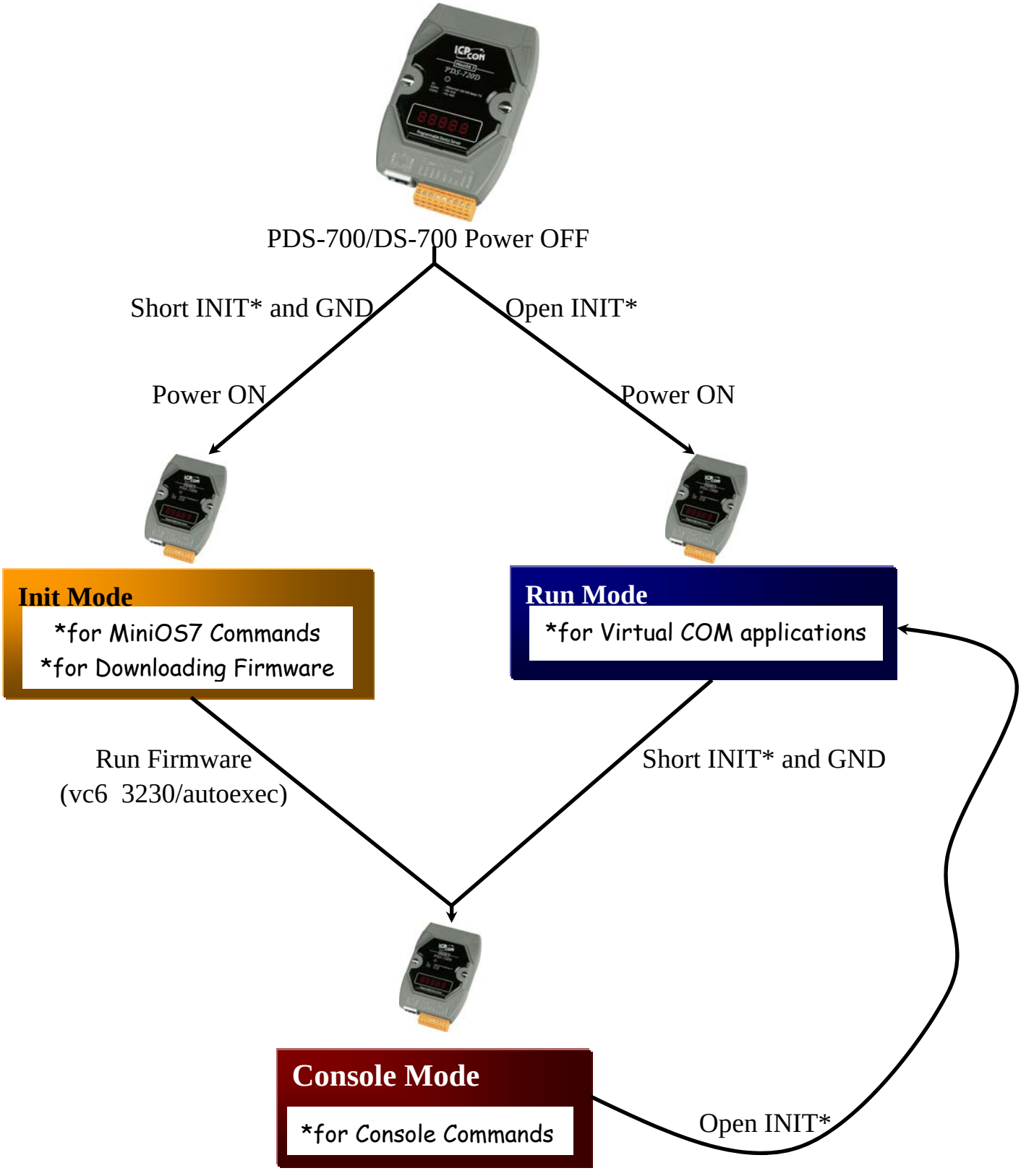
<3> Output command value: If the Host Watchdog Timeout status is clear, and the user issues a digital output command, to the module to change the output value, such as @AA (Data) or #AABBDD, the module will respond “success” (receive >).

Latch Digital Input

If, for example, the user connects a key switch to the digital input channel and wants to read the keystrokes, the key input is a digital input pulse, and the keystroke will be lost. By using command $AA6 to read the A and B positions, the response would be that there was no keystroke and the keystroke information will be lost. The read latch-low digital input command, $AAL0, will solve this problem. When issuing a $AAL0 command at the A and B positions, the response will denote that there is a low pulse between A and B position signifying a keystroke.

8. Console / Telnet Commands List

8.1. Operation Flowchart



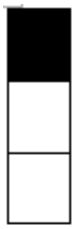
8.2. Regulate Init/Normal Mode

PDS-700

Normal/Run Mode

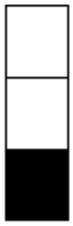
Init Mode

DS-700/PDS-782(D)-25/PDS-775(D)-A



Init Mode

Flash Lock Mode



Normal/Run Mode

8.3. Comparison Sheet (Init/Run/Console Modes)

Mode	Firmware	Init* and GND pins	VCOM Commands	Telnet Commands	Console Commands
Init	*Stop*	-	*No*	*No*	*No*
	Init Mode is used to upgrade firmware and accepts MiniOS7 commands (from PDS.COM1) only.				
Run	*Running*	*Open*	*Yes*	*Yes*	*No*
	Run Mode is used for Virtual COM applications, and accepts Virtual COM commands (TCP port 10000) and Telnet commands (TCP port 23).				
Console	*Running*	*Short*	*Yes*	*Yes*	*Yes*
	Console Mode is used to configure the Virtual COM. PDS.COM1 is the console port that accepts console commands while other ports are still working with Virtual COM applications.				

8.4. Command List

No.	Command	Description
1	IPFILTER	Retrieves/Sets the IP addresses that are allowed to access the PDS.
2	IPCONF	Queries the network configuration. (IP/Mask/Gateway/MAC addresses).
3	SOCKET	Lists all the status of sockets (Listen/Not Used Yet) together with the type of each socket (TCP Server: Port No./UDP/Unused).
4	COM	Queries or sets the configuration of the COM Ports (Baud Rate/Parity /Stop Bits)
5	Broadcast	Queries or sets the Broadcast parameter, which determines whether or not the module can receive Broadcast packets.
6	SystemTimeout	If PDS-700/DS-700 has no network communications during the SystemTimeout period, the PDS-700/DS-700 will reboot it-self automatically.
7	SocketTimeout	If there is no data send/receive on the connection during the SocketTimeout period, the PDS-700/DS-700 will close the connection automatically.
8	M	Gets/Sets the echo mode. /M0: Transparent Mode, Multi-Echo, Data-Shared. /M1: Slave Mode, Single-Echo, None-Shared.
9	EchoCmdNo	Queries or sets the EchoCmdNo parameter that enables or disables adding Command Number before response.
10	EndChar	Sets a character that determines the end of a response string.
11	IP	Queries or sets the IP address.
12	MASK	Queries or sets the subnet Mask value.
13	GATEWAY	Queries or sets the Gateway address.
14	MAC	Queries the MAC address.
15	NAME	Queries the module name.
16	ALIAS	Sets the alias for a PDS-700/DS-700.
17	DHCP	Enables/Disables the DHCP client.
18	UDP	Sets whether to reply to a UDP search command.
19	VER	Queries the version information
20	SAVE	Determines whether or not backup copies of the "autoexec.bat" and "vcom.ini" files are saved when using the “load” command.
21	LOAD	Loads file to the built-in flash disk on PDS-700/DS-700. It should be used to update firmware only.
22	CONFIG	Restores the factory default settings.
23	RESET	Reboots the PDS-700/DS-700 module.
24	QUIT	Exits the running firmware.

8.4.1. IPFILTER

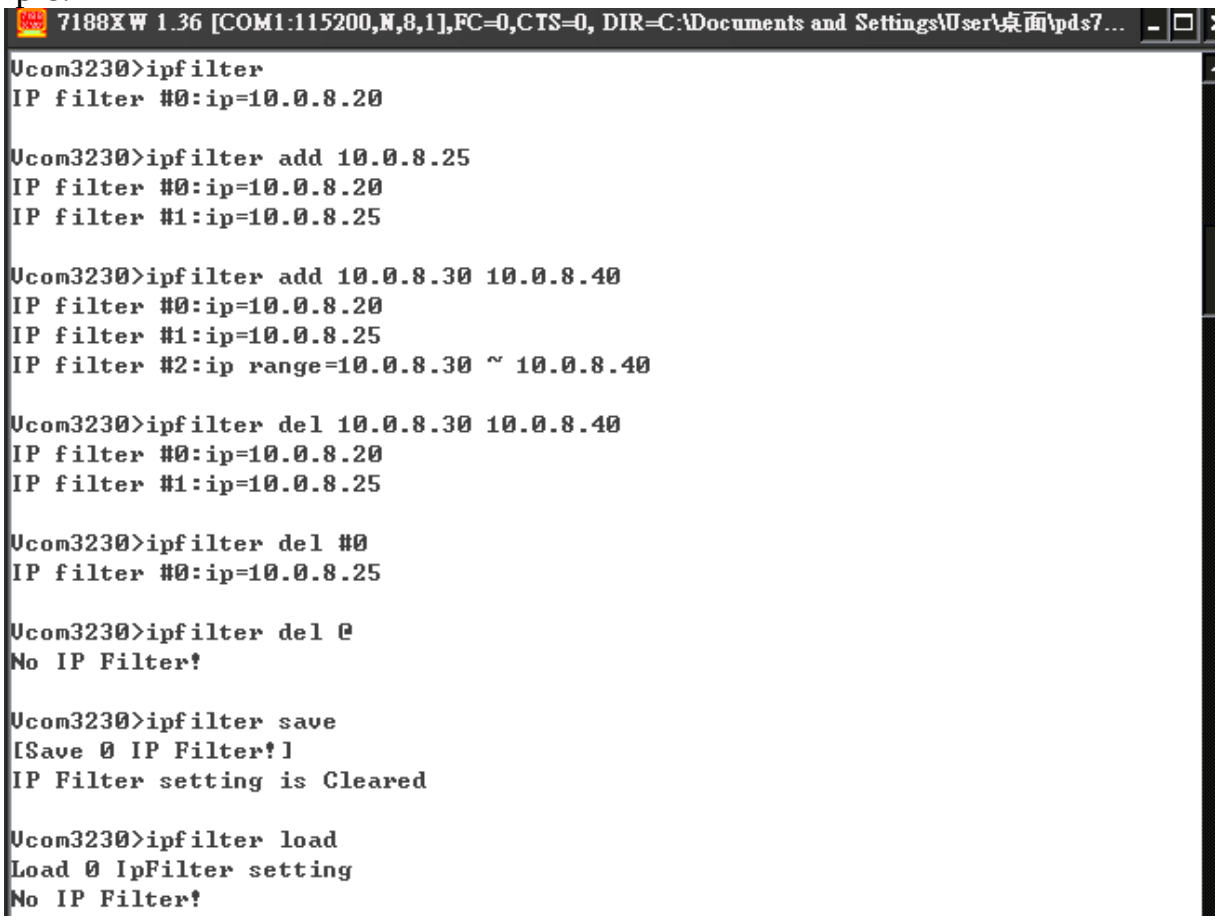
Description: This command is used to query or edit IP filter table. The IP filter table restricts the access of packets based on the IP header. If one or more IP addresses are saved into the IP filter table, only clients whose IP is specified in the IP filter table can access the PDS-700/DS-700.

Effect: Immediate

Command	Arguments	Description
ipfilter		Queries the IP filter table.
ipfilter	ADD ip1 ADD ip1 ip2	Adds an IP address to the IP filter table. Adds a range of IP addresses (ip1 ~ ip2) to the IP filter table.
ipfilter	DEL ip1 DEL ip1 ip2	Deletes an IP address (ip1) from the IP filter table. Deletes a range of IP addresses (ip1 ~ ip2) from the IP filter table. The IP address that follows the DEL command should already be listed in the IP filter table.
ipfilter	DEL #n	Deletes item “n” from the IP filter table.
ipfilter	DEL @	Deletes all items from the IP filter table.
ipfilter	SAVE	Saves the IP filter table to the EEPROM. If the IP filter table is empty, the data in EEPROM will be cleared.
ipfilter	LOAD	Loads the IP filter table from the EEPROM.

※ The IP filter table is loaded automatically when the PDS-700/DS-700 is booted.
※ Use the “ipfilter save” command to save a new IP filter table to the EEPROM.

Example:


7188XW 1.36 [COM1:115200,N,8,1],FC=0,CTS=0, DIR=C:\Documents and Settings\User\桌面\pds7...
Vcom3230>ipfilter
IP filter #0:ip=10.0.8.20
Vcom3230>ipfilter add 10.0.8.25
IP filter #0:ip=10.0.8.20
IP filter #1:ip=10.0.8.25
Vcom3230>ipfilter add 10.0.8.30 10.0.8.40
IP filter #0:ip=10.0.8.20
IP filter #1:ip=10.0.8.25
IP filter #2:ip range=10.0.8.30 ~ 10.0.8.40
Vcom3230>ipfilter del 10.0.8.30 10.0.8.40
IP filter #0:ip=10.0.8.20
IP filter #1:ip=10.0.8.25
Vcom3230>ipfilter del #0
IP filter #0:ip=10.0.8.25
Vcom3230>ipfilter del @
No IP Filter!
Vcom3230>ipfilter save
[Save 0 IP Filter!]
IP Filter setting is Cleared
Vcom3230>ipfilter load
Load 0 IpFilter setting
No IP Filter!

8.4.2. IPCONF

Description: This command is used to display the network configuration information, such as IP/Mask/Gateway/MAC addresses and the status of DHCP/ACK_Delay/Free Memory/Socket status.

Effect: Immediate

Command	Argument	Description
ipconf		Queries the network configuration.

Example:

8.4.3. SOCKET

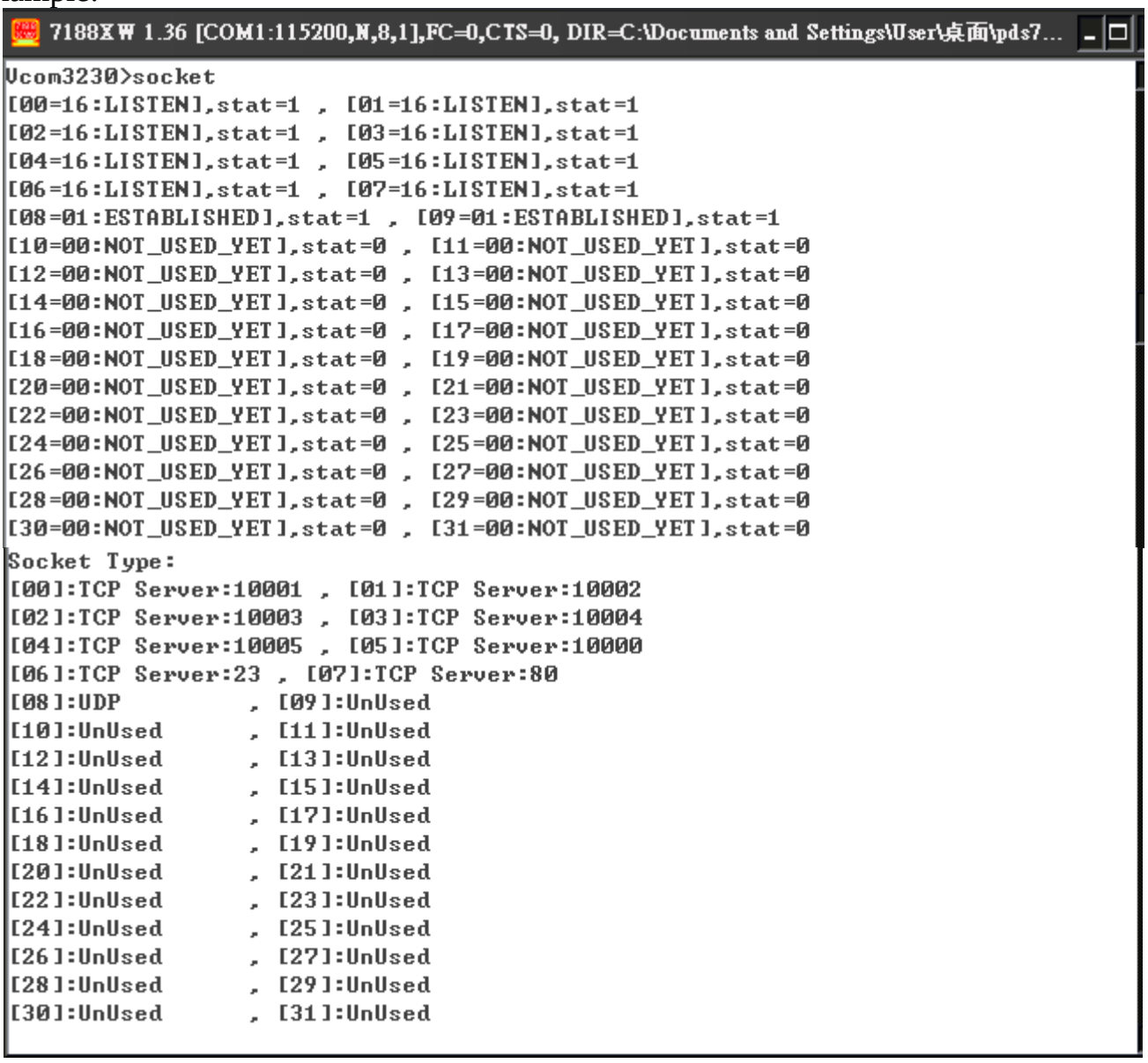
Description: This command lists the status of all sockets (Listen/Not Used Yet) together with the type of each socket (TCP Server: Port No./UDP/Unused)

If stat = 1, the socket is used. If stat = 0, the socket is not yet used.

Take Effect: Immediately

Command	Argument	Description
socket		Lists the status of all sockets.

Example:



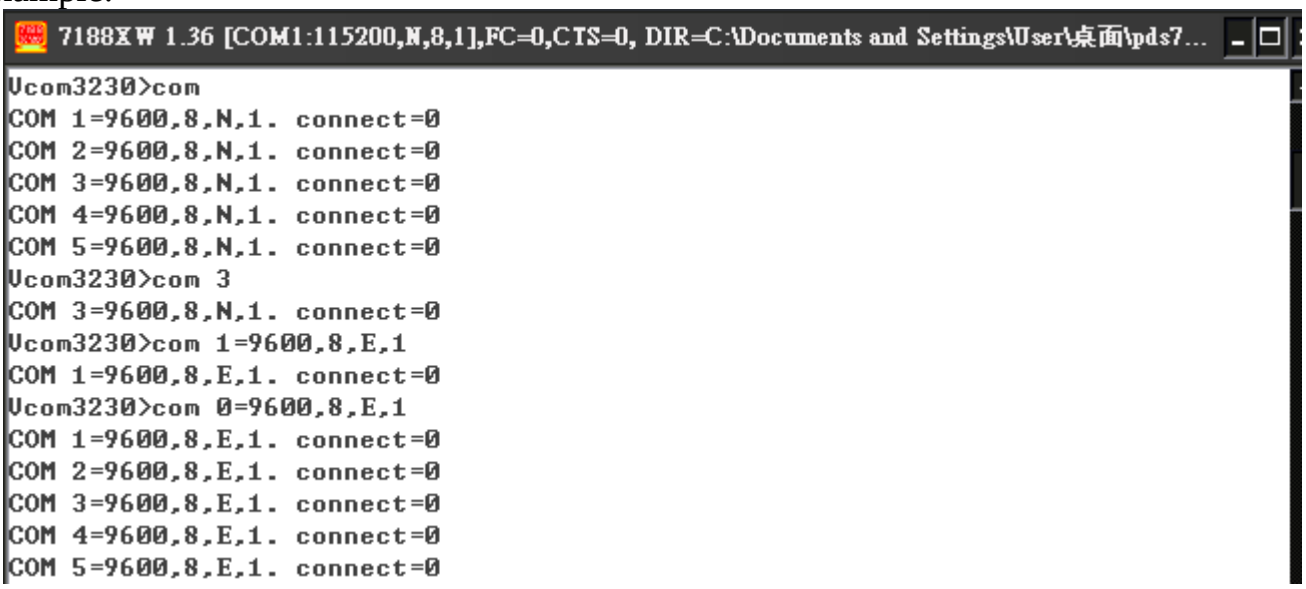
8.4.4. COM

Description: This command queries or sets the configuration of the COM Ports (Baud Rate/Parity/Stop bits).

Effect: Immediate

Command	Arguments	Description
com		Queries the configuration of all COM Ports.
com	n	Queries configuration of COM Port “n”. If n = 0, the configuration of all COM Ports will be listed in the same way as using the command “com” above.
com	N = BaudRate, DataBits, Parity,StopBit(s)	Sets the configuration of COM Port “n”. If n = 0, the settings will be valid for all Com Ports on the PDS-700/DS-700.

Example:



8.4.5. Broadcast

Description: This command is used to Enable/Disable listening broadcast packets on PDS-700/DS-700.

Effect: Immediate

Command	Arguments	Description
Broadcast		Queries the Broadcast settings.
Broadcast	= 1	Sets Broadcast = 1. The system is able to receive broadcast packets.
Broadcast	= 0	Sets Broadcast = 0. The system will ignore broadcast packets.

Example:

8.4.6. SystemTimeout (ms)

Description: This command queries or sets the system timeout value.

If the SystemTimeout is greater than zero, and the PDS-700/DS-700 does not receive any packets from any client for longer than the SystemTimeout period, the PDS-700/DS-700 will reboot itself.

Effect: Immediate

Command	Arguments	Description
SystemTimeout		Queries the SystemTimeout settings.
SystemTimeout	= nnnnn	Sets the SystemTimeout. (Unit : ms) Default factory setting is 300000 ms (= 300 seconds = 5 minutes), min. value is 30000 ms (= 30 seconds)

Example:

8.4.7. SocketTimeout (ms)

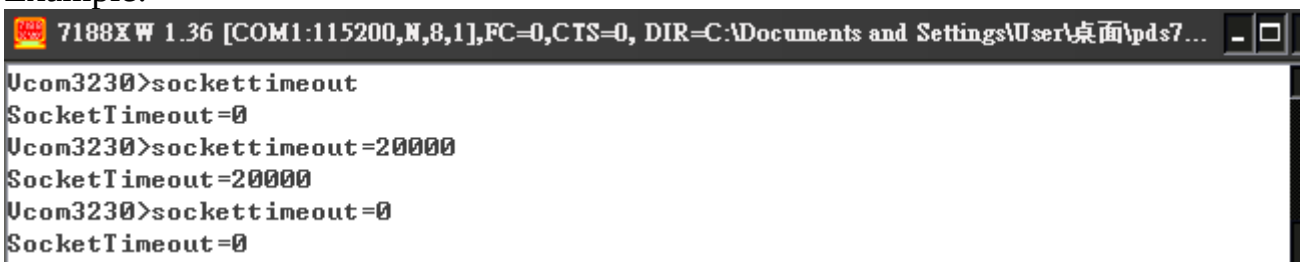
Description: This command is used to query or set the SocketTimeout parameter.

If the SocketTimeout is greater than zero, and the PDS-700/DS-700 does not receive any data from a client PC for longer than the SocketTimeout period, the PDS-700/DS-700 will close the socket connection between itself and the client PC.

Effect: Immediate

Command	Arguments	Description
SocketTimeout		Queries the SocketTimeout settings.
SocketTimeout	= nnnnn	Sets the SocketTimeout. (Unit : ms) default = 0 (disable), min = 10000

Example:



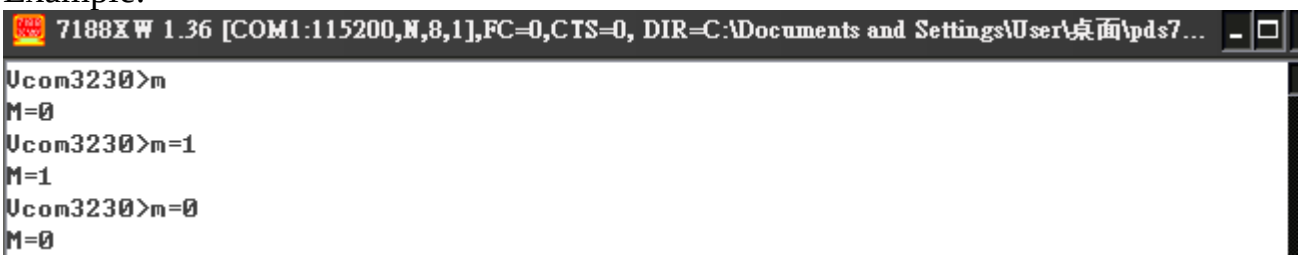
8.4.8. M

Description: This command is used to query or set the echo mode.

Effect: Immediate

Command	Arguments	Description
M		Queries the echo mode settings.
M	= 0	Sets the multi-echo mode to enable. When set to multi-echo mode, the PDS-700/DS-700 echoes data from a device to all clients that are connected.
M	= 1	Sets the single-echo mode to enable. When set to single-echo mode, the PDS-700/DS-700 echoes data from a device to the client that requested the service.

Example:



8.4.9. EchoCmdNo

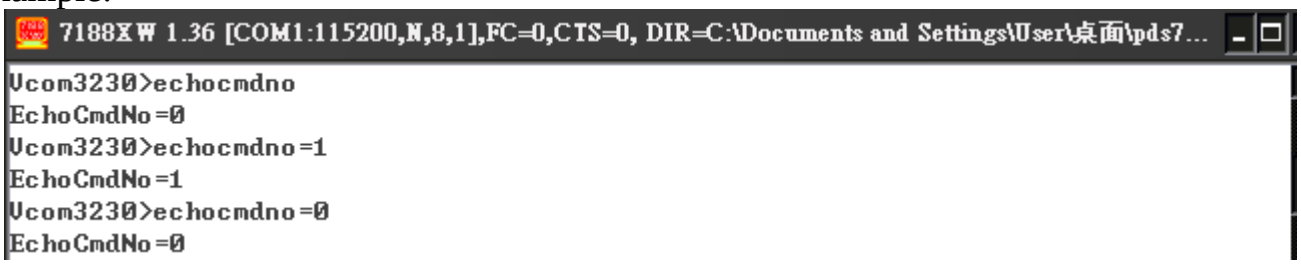
Description: This command is used to query or set the EchoCmdNo parameter.

The EchoCmdNo parameter is used to set whether the PDS-700/DS-700 prefixes the Virtual COM command to the corresponding response. (Virtual COM commands are used to configure a PDS-700/DS-700 through TCP port 10000)

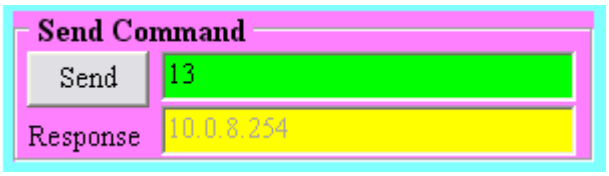
Effect: Immediate

Command	Arguments	Description
EchoCmdNo		Queries the EchoCmdNo settings.
EchoCmdNo	= 0	If EchoCmdNo = 0, a Virtual COM command number will not be prefixed to the corresponding response.
EchoCmdNo	= 1	If EchoCmdNo = 1, a Virtual COM command number will be prefixed to the corresponding response.

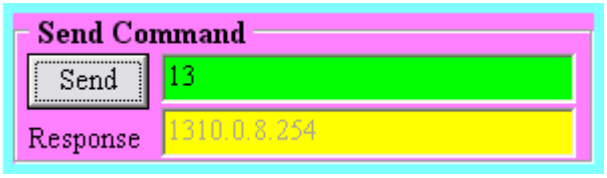
Example:



EchoCmdNo = 0



EchoCmdNo = 1



8.4.10. EndChar

Description: This command is used to query or set the EndChar parameter.

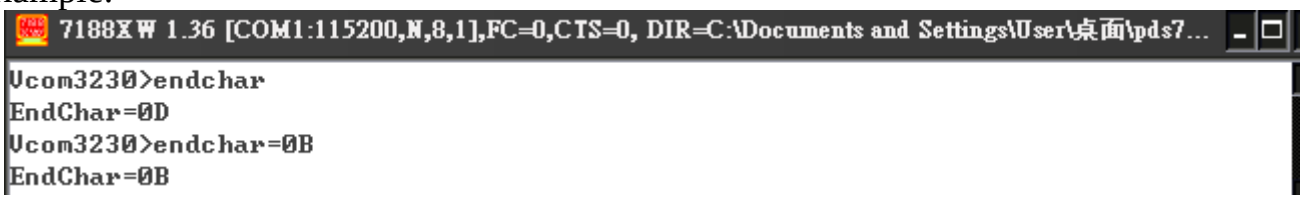
PDS-700/DS-700 sends out the response string from serial port to TCP client immediately when it received a char on the response string that matching the EndChar.

Set EndChar = 00 to disable the EndChar feature.

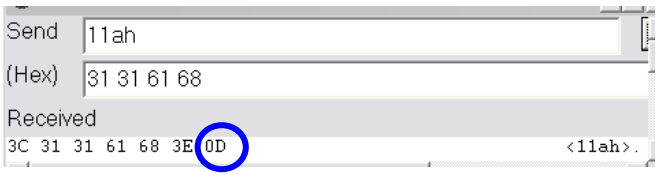
Effect: Immediate

Command	Arguments	Description
Endchar		Queries the endchar setting.
Endchar	= HH	Sets the endchar.

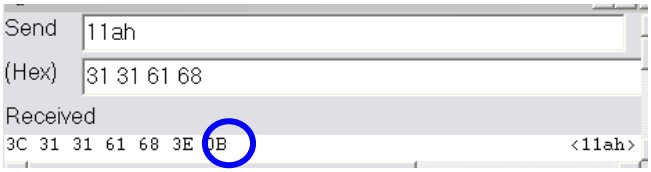
Example:



EndChar = 0D



EndChar = 0B



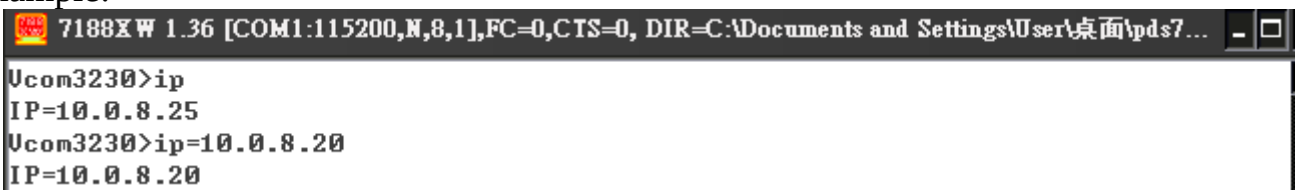
8.4.11. IP

Description: This command is used to query or set the IP address.

Effect: After the next reboot.

Command	Arguments	Description
IP		Queries the IP address.
IP	= xxx.xxx.xxx.xxx	Sets the IP address.

Example:



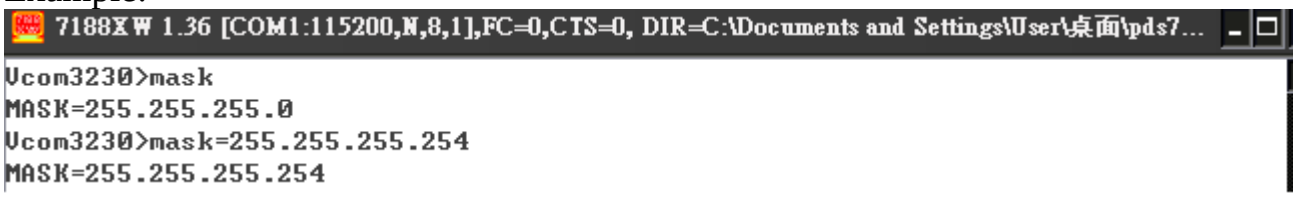
8.4.12. MASK

Description: This command is used to query or set the subnet Mask value.

Effect: After the next reboot.

Command	Arguments	Description
mask		Queries the subnet Mask value.
mask	= xxx.xxx.xxx.xxx	Sets the subnet Mask value.

Example:



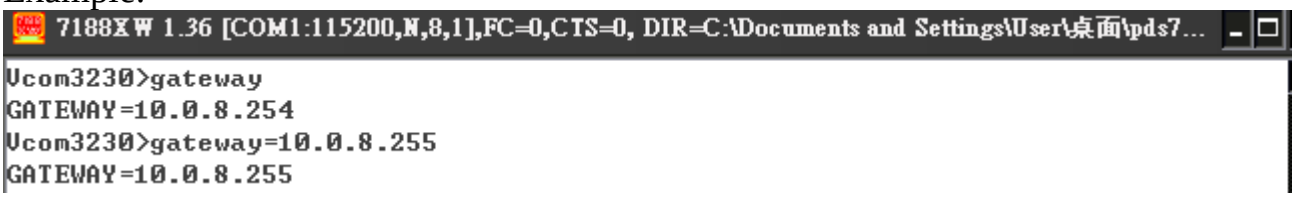
8.4.13. GATEWAY

Description: This command is used to query or set the outgoing Gateway address of the subnet.

Effect: After the next reboot.

Command	Arguments	Description
Gateway		Queries the Gateway address.
Gateway	= xxx.xxx.xxx.xxx	Sets the Gateway address

Example:



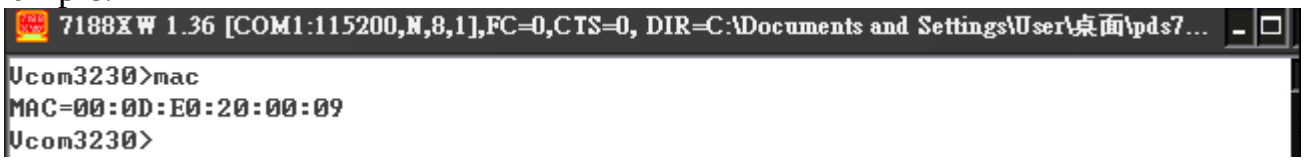
8.4.14. MAC

Description: This command is used to query the MAC address.

Effect: Setting the address is not allowed.

Command	Arguments	Description
Mac		Queries the MAC address.(Setting the address is not allowed)

Example:



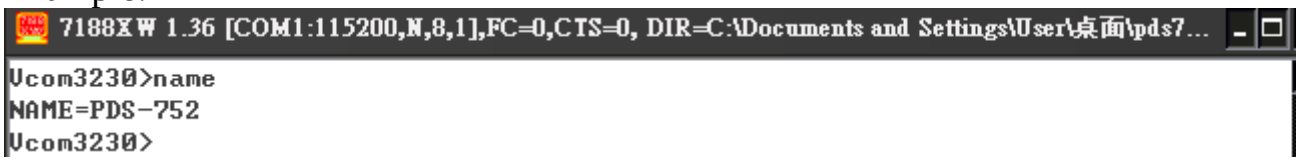
8.4.15. NAME

Description: This command is used to query the name of a PDS-700/DS-700 module.

Effect: Setting the name is not allowed.

Command	Arguments	Description
name		Queries the name of a PDS-700/DS-700 module.

Example:



8.4.16. ALIAS

Description: This command is used to query or set the alias of a PDS-700/DS-700 module. The maximum character length of PDS-700/DS-700 alias name is 16 bytes.

Effect: Immediate

Command	Arguments	Description
alias		Queries the alias.
alias	= xxxx	Sets the alias of a PDS-700/DS-700 module to “xxxx”.

Example:

8.4.17. DHCP

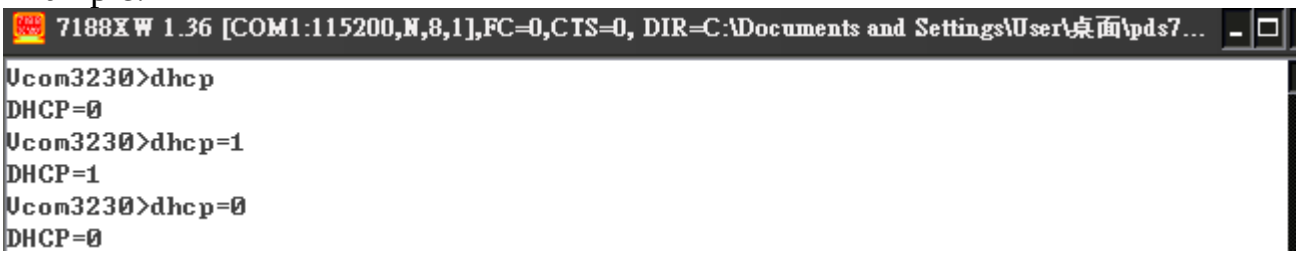
Description: This command is used to set the DHCP client to either enabled or disabled.

DHCP function will get a dynamic IP address setting for PDS-700/DS-700 automatically. Thus it's recommended to disable DHCP function and use a static IP address setting. This prevents you to configure virtual COM mappings again and again.

Effect: Immediate

Command	Arguments	Description
DHCP	= 0	Disables the DHCP client.
DHCP	= 1	Enables the DHCP client.

Example:



8.4.18. UDP

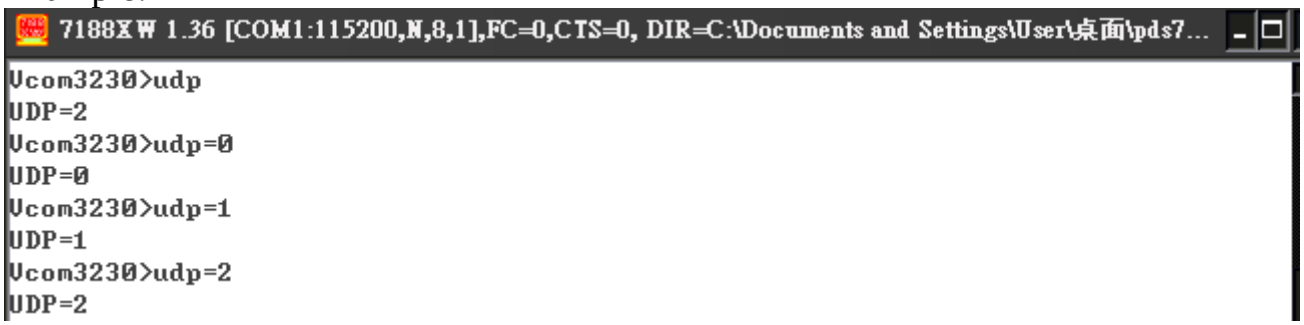
Description: This command is used to configure the UDP Search function.

UDP is used to set the action mode for when a PDS-700/DS-700 module receives a UDP search command.

Effect: Immediate

Command	Arguments	Description
UDP	= 0	Rejects UDP search commands. The PDS-700/DS-700 will not reply to the UDP search command, and can not be searched again.
UDP	= 1	Replies to UDP search commands. The PDS-700/DS-700 modules will reply to the UDP search command, and can be searched.
UDP	= 2 (Default)	Replies to UDP search commands till a client is connected.

Example:



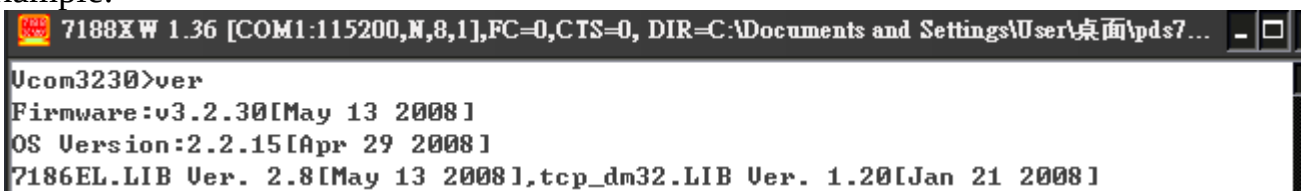
8.4.19. VER

Description: This command is used to query the version information for a PDS-700/DS-700 module.

Effect: Setting the version information is not allowed.

Command	Argument	Description
VER		Queries the version information.

Example:


7188XW 1.36 [COM1:115200,N,8,1],FC=0,CTS=0, DIR=C:\Documents and Settings\User\桌面\pds7...
Vcom3230>ver
Firmware:v3.2.30[May 13 2008]
OS Version:2.2.15[Apr 29 2008]
7186EL.LIB Ver. 2.8[May 13 2008],tcp_dm32.LIB Ver. 1.20[Jan 21 2008]

8.4.20. SAVE

Description: This command is used to set the PDS-700/DS-700 module to backup or no-backup “autoexec.bat” and “vcom.ini” files when using “load” command.

Effect: Immediate

Command	Arguments	Description
save	= 1	When the “load” command is used, backup copies of the "autoexec.bat" and "vcom.ini" files will be saved.
save	= 0 (Default)	When the “load” command is used, backup copies of the "autoexec.bat" and "vcom.ini" files will NOT be saved.

Example: see images [21-1] and [21-2] below.

8.4.21. LOAD

Description: This command is used to loads file to the built-in flash disk on PDS-700/DS-700 module. It should be used to update firmware only.

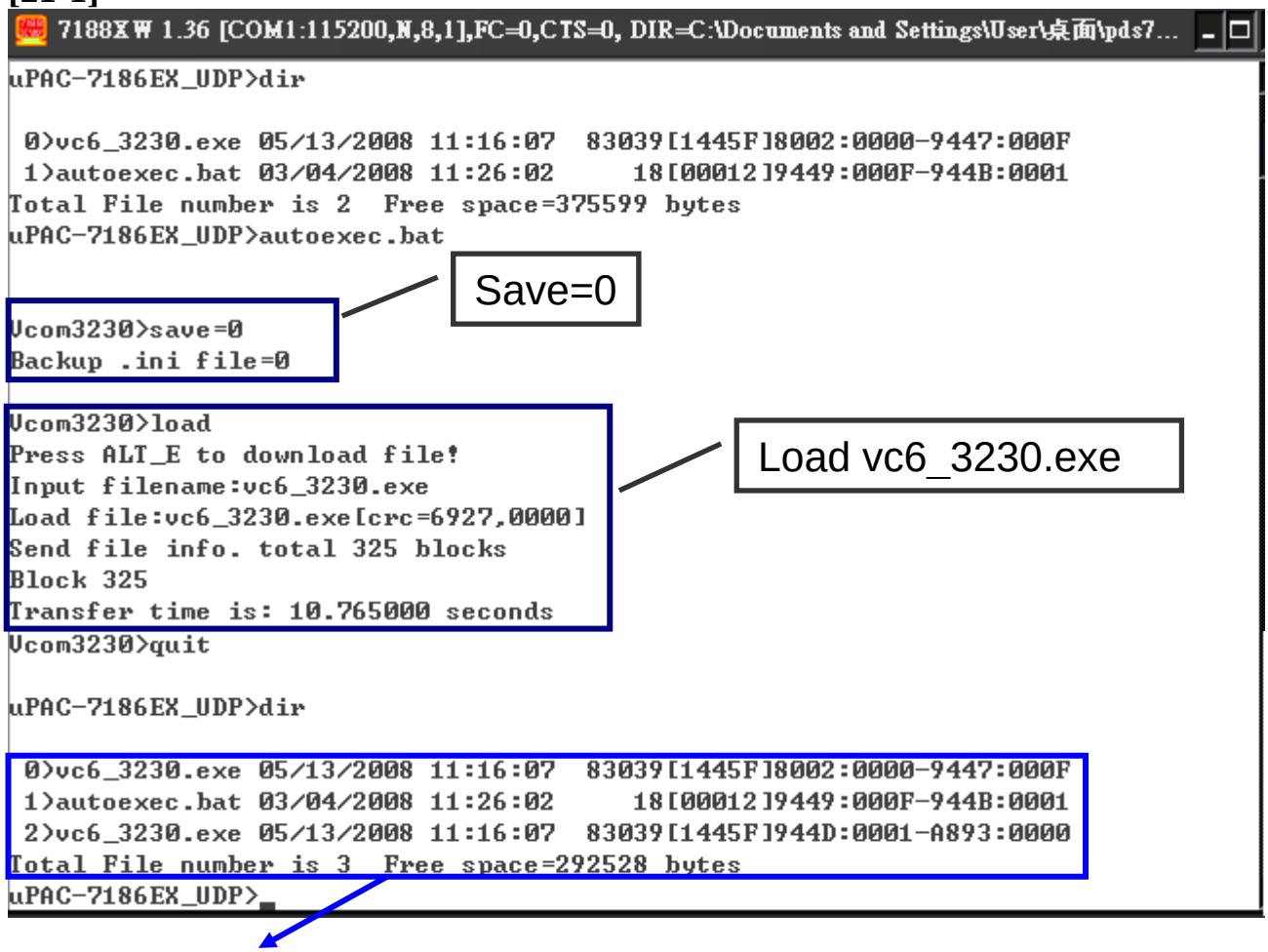
Effect: Immediate

Command	Argument	Description
load		The command is coordinated with the MiniOS7 “load” command and can be used to renew the “vcom3230.exe,” “vcom.ini” or “autoexec.bat” file(s).

※”Load” is not a Telnet command.

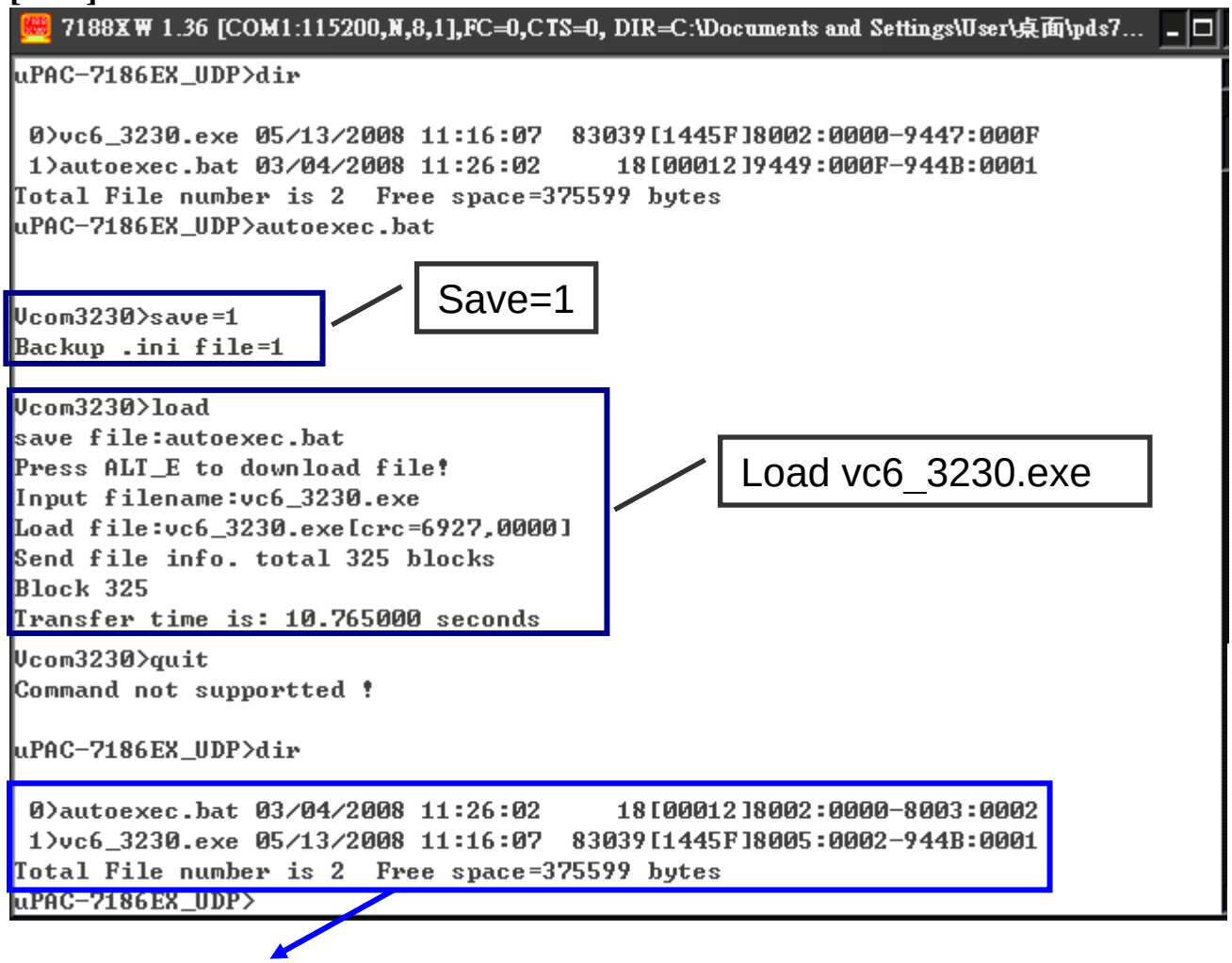
Example:

[21-1]



※When save = 0, the system doesn’t back up the "autoexec.bat" and "vcom.ini" files to memory, and doesn’t clear the flash disk. It only loads the file that is selected specified.

[21-2]



※ When save = 1, system will back up the "autoexec.bat" and "vcom.ini" files to memory first, clear all files in the flash disk, and then load the "autoexec.bat" and "vcom.ini" files from memory and run the “load” command to load the specified file(s).

8.4.22. CONFIG

Description: This command is used to clear the settings in the EEPROM.

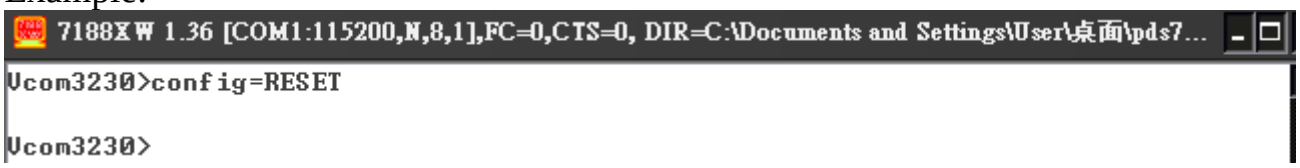
Effect: Immediate

Command	Argument	Description
config	= RESET	Clears the settings in the EEPROM. After reboot, the firmware will use the new (default) settings on EEPROM. Note: ("RESET" MUST be in capital letters.)

※When “Config=RESET” is used, the Password, Alias and IPFILTER settings will also be cleared, but the IP/MASK/GATEWAY addresses will not.

※The SystemTimeout setting is also cleared to 0 by the "config=RESET" command, you have to configure the SystemTimeout value again. The default factory setting of SystemTimeout value should be 300000ms (= 300 seconds).

Example:



8.4.23. RESET

Description: This command is used to reboot the PDS-700/DS-700 module.

Effect: Immediate

Command	Argument	Description
reset		Reboot the PDS-700/DS-700 module.

Example:

7188XW 1.36 [COM1:115200,N,8,1],FC=0,CTS=0, DIR=C:\Documents and Settings\User\桌面\pds7...
Vcom3230>reset
ICP DAS MiniOS7_UDP for uPAC-7186EX Ver. 2.02 build 015,Apr 29 2008 15:35:16
OS id=31
SRAM:512K, FLASH MEMORY:512K
[CPU=R2240]
CPU internal WDT is ENABLED(WDT timeout=0.8 sec)
Serial number= 01 63 42 FD 0E 00 00 D5
uPAC-7186EX_UDP>

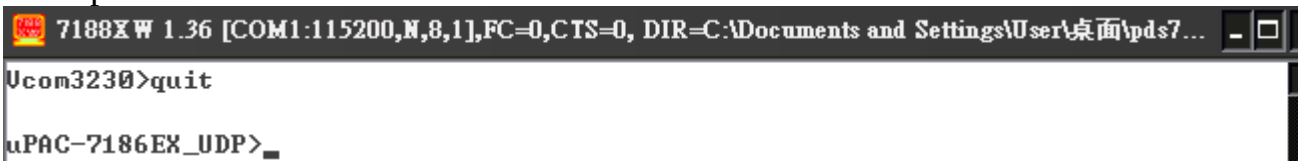
8.4.24. QUIT

Description: This command is used to stop and quit the firmware of PDS-700/DS-700 module.

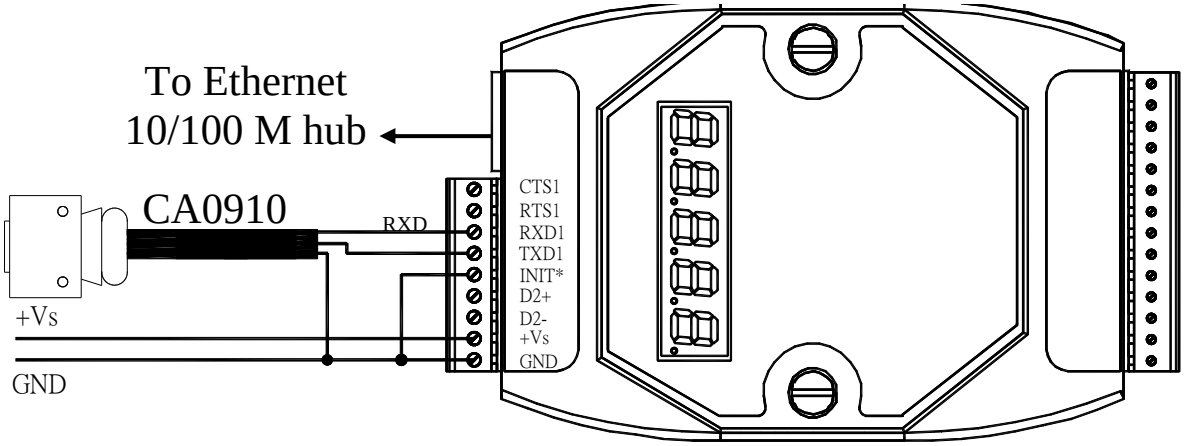
Effect: Immediate

Command	Argument	Description
quit		Quits the firmware.

Example:



Appendix A: Linking to a Development PC



Step 1: Connect the download-cable, CA0910, between the PDS-700 module and COM 1 (or COM 2) of the development PC as per above the diagram.

Step 2: Connect the INIT* pin to the GND pin, as shown in the above diagram.

Step 3: Unzip the "7188XW_yyyymmdd.zip" file on the PC. The file is located in the CD:\Napdos\MiniOS7\utility folder.

Step 4: Apply power (+Vs, GND) to the PDS-70 module. +Vs can be anywhere from +30 ~ +10 V. The DS-700 module +Vs can be anywhere from +48 ~ +12 V.

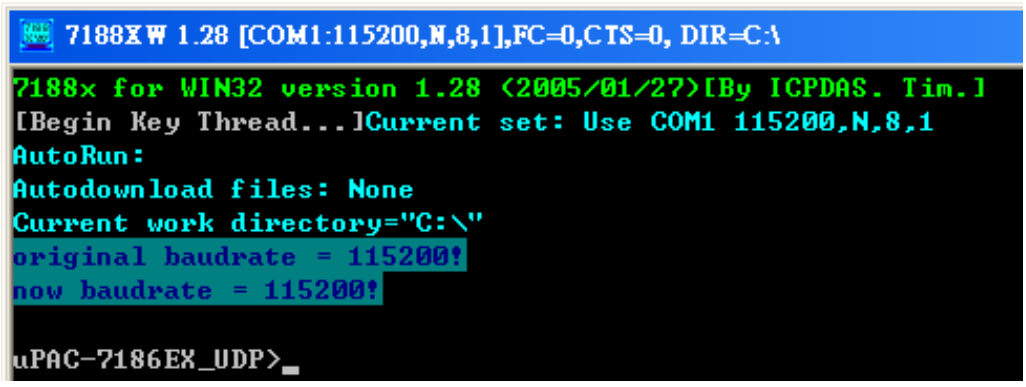
Step 5: Check that the 5-digit 7-SEG LED is continuously showing the following information:

Hours.Minutes.Seconds

Note: Only display versions of PDS-700 modules have a 5-digit 7-SEG LED.

Step 6: Execute 7188XW.EXE/C#, and change the Baud Rate to 115200 bps, N81. "/C#" is the COM Port of the development PC.

Step 7: Press [Enter] twice on the development PC:



Step 8: Read the configuration of the PDS-700/DS-700:

```
uPAC-7186EX_UDP>ip
IP=10.0.8.20
uPAC-7186EX_UDP>mask
MASK=255.255.255.0
uPAC-7186EX_UDP>gateway
Gateway=10.0.8.254
uPAC-7186EX_UDP>mac
Ethernet Address = 00:0d:e0:20:00:07
uPAC-7186EX_UDP>setcom 1
Current set is: 9600,8,0,1
```

Read configuration command

- ip
- mask
- gateway
- mac
- setcom port

Note: The configuration of the PDS-700/DS-700 as follows can be changed:

```
uPAC-7186EX_UDP>ip 192.168.41.1
Set IP=192.168.41.1
[ReadBack]IP=192.168.41.1
uPAC-7186EX_UDP>mask 255.255.255.0
Set MASK=255.255.255.0
[ReadBack]MASK=255.255.255.0
uPAC-7186EX_UDP>gateway 192.168.41.4
Set GATEWAY=192.168.41.4
[ReadBack]Gateway=192.168.41.4
uPAC-7186EX_UDP>setcom 1 115200,n,8,1
Current set is: 9600,8,0,1
Set to: 115200,8,0,1 [checksum:CC]
```

Settings configuration command

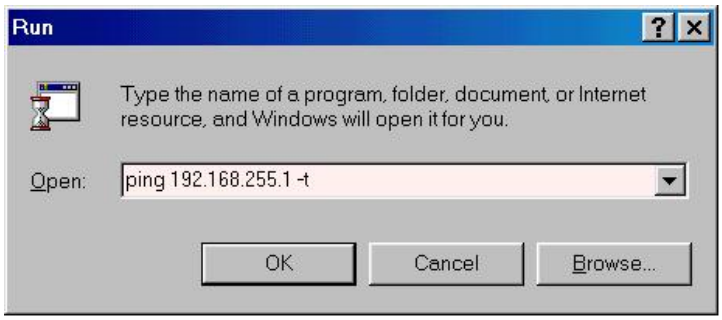
- ip [new ip]
- mask [new mask]
- gateway [new gateway]
- mac [new mac]
- setcom port [baud][data_bit][parity][stop_bit]

"setcom" parameters are as follows:

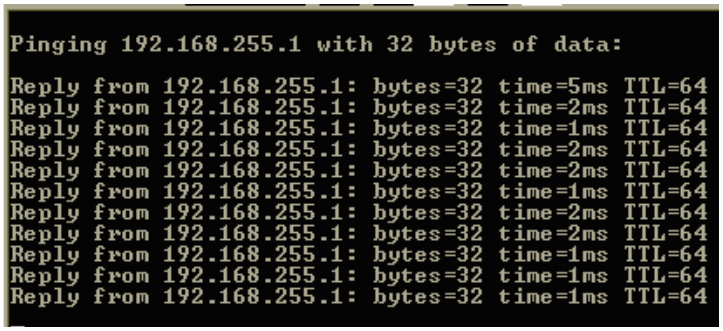
Port	1 - 8
Baud	2 - 921600
DataBit	7, 8: for COM 1 and COM 2 5,6,7,8: for COM 3 ~ COM 8
Parity	N, n : None parity E, e : Even parity O, o : Odd parity M, m : Mark, parity = 1 S, s : Space, parity = 0
StopBit	1: for COM 1, COM 2 1, 2: for COM 3 ~ COM 8

Step 9: Disconnect the INIT* pin from the GND pin.
Step 10: Power-off the module then power on again.

Step 11: Execute **ping 192.168.255.1 –t** using a run command as follows:



Execute Ping 192.168.255.1 on the PC client.


Pinging 192.168.255.1 with 32 bytes of data:
Reply from 192.168.255.1: bytes=32 time=5ms TTL=64
Reply from 192.168.255.1: bytes=32 time=2ms TTL=64
Reply from 192.168.255.1: bytes=32 time=1ms TTL=64
Reply from 192.168.255.1: bytes=32 time=2ms TTL=64
Reply from 192.168.255.1: bytes=32 time=2ms TTL=64
Reply from 192.168.255.1: bytes=32 time=1ms TTL=64
Reply from 192.168.255.1: bytes=32 time=2ms TTL=64
Reply from 192.168.255.1: bytes=32 time=2ms TTL=64
Reply from 192.168.255.1: bytes=32 time=1ms TTL=64
Reply from 192.168.255.1: bytes=32 time=1ms TTL=64
Reply from 192.168.255.1: bytes=32 time=1ms TTL=64

The ping results should be smooth and continuous

Note:

- **192.168.255.1** is the default IP of the PDS-700/DS-700 module. The IP address can be changed using the instructions in step 8.
- If the PDS-700/DS-700 cannot be successfully pinged from the PC, refer to step 8 to change the configuration of the PDS-700/DS-700 module. (the mask and gateway addresses of PDS-700/DS-700 module and the PC should make the network definition.
- The MAC address of the PDS-700/DS-700 module should be unique on the same network. Refer to step 8 for details of how to change the MAC address of the PDS-700/DS-700 module.
- Each PDS-700/DS-700 MAC address is unique in the default shipping.

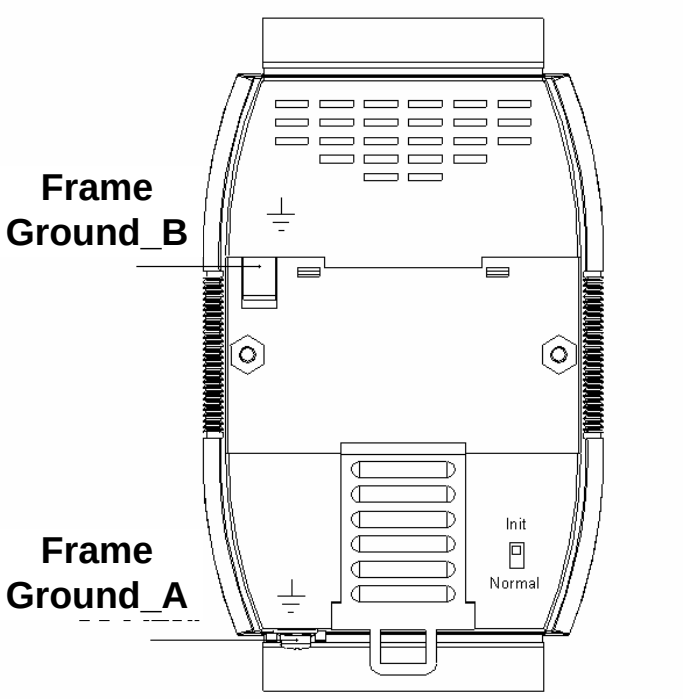
In general, if the host PC can ping the PDS-700/DS-700 module smoothly and continuously, all other software and drivers for the PDS-700/DS-700 module will operate correctly. Therefore, users should ensure that the development PC is able to ping the PDS-700/DS-700 module smoothly before any further testing is carried out.

Appendix B: Frame Ground

Electronic circuits are constantly vulnerable to Electro Static Discharge (ESD), which becomes worse in a continental climate area. PDS-700/DS-700 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

It is recommended that the Frame Ground of the PDS-700/DS-700 module is corrected to the earth ground, such as the ground of an AC power supply, to provide better ESD protection for the module.

The PDS-700/DS-700 module is designed with two Frame Ground contact points, Frame-Ground-A and Frame-Ground-B, as shown in the figure below. When mounted to a DIN rail, Frame-Ground-B and the DIN rail are in contact. Thus, protection can be achieved by also connecting the DIN rail to earth ground.



Glossary

1. Ethernet

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer local area network (LAN) technology today. Ethernet is a best-effort delivery system that uses CSMA/CD technology. It recognizes hosts using 48-bit MAC address.

2. Internet

Physically, the Internet is a collection of packet switching networks interconnected by gateways along with TCP/IP protocol that allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

3. TCP/IP

The transmission Control Protocol (TCP) and the Internet Protocol (IP) are the standard network protocols. They are almost always implemented and used together and called TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

4. TCP (Transmission Control Protocol)

TCP provides a reliable flow of data between two hosts. It is associated with tasks such as dividing the data passed to it from applications into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

5. UDP (User Datagram Protocol)

UDP provides a much simpler service to the application layer. It just sends packets of data from one host to the other. But there is no guarantee that the packets will reach the destination host.

6. Gateway

Computers that interconnect two networks and pass packets from one to the other are called Internet Gateways or Internet Routers. Gateways route packets that are based on the destination network, not on the destination host.

7. IP (Internet Protocol) address

Every interface on an Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers. They are normally written as four decimal numbers, one for each byte of the address such as "**192.168.41.1"**. This is called dotted-decimal notation.

8. MAC (Media Access Control) address

To allow a computer to determine which packets are meant for it, each computer attached to an Ethernet is assigned a 48-bit integer known as its MAC address (also called an Ethernet address, hardware address or physical address). They are normally written as eight hexadecimal numbers such as "**00:71:88:af:12:3e:0f:01**". Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture the Ethernet interface hardware. Thus, no two hardware interfaces have the same MAC address.

9. Subnet Mask

Subnet mask is often simply called the mask. Given its own IP address and its subnet mask, a host can determine if a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise if, will be delivered via gateways or routers.

10. ARP (Address Resolution Protocol)

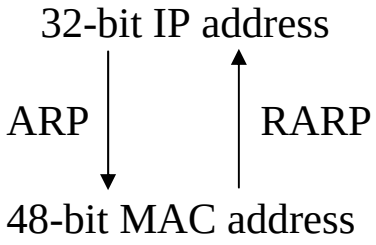
Consider two machines A and B that share a physical network. Each has an assigned IP address IP_A and IP_B, and a MAC address the MAC_A and MAC_B. The goal is to devise low-level software that hides MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine A wants to send a packet to machine B across a physical network to which they are both attached, but A only has the Internet address for B, IP_B. The question arises: how does A map that address to the MAC address for B, MAC_B?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since it happens automatically and is normally not a concern for either the application user or the system administrator.

11. RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address.



12. ICMP (Internet Control Messages Protocol)

No system works correctly all the time. ICMP provides a method of communicating between the Internet Protocol software on one machine and the Internet Protocol software on another. It allows gateways to send error or control messages to other gateways or allows a host to know what is wrong with the network communication.

13. Ping

Ping sends an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, you won't be able to use Telnet or FTP to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine what the problem is.

14. Packet

A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

15. Socket

Each TCP segment contains the source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP address in the IP header, uniquely identify each connection.

The combination of an IP address and a port number is called a socket.

16. Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application program that initiates peer to peer communication is called a client. End users usually invoke client programs when they use network services.

Most client programs consist of conventional application program develop tools. Each time a client program is executed, it contacts a server, sends a request and waits for a response. When the response arrives, the client program continues processing. Client programs are often easier to develop than servers, and usually require no special system privileges to operate.

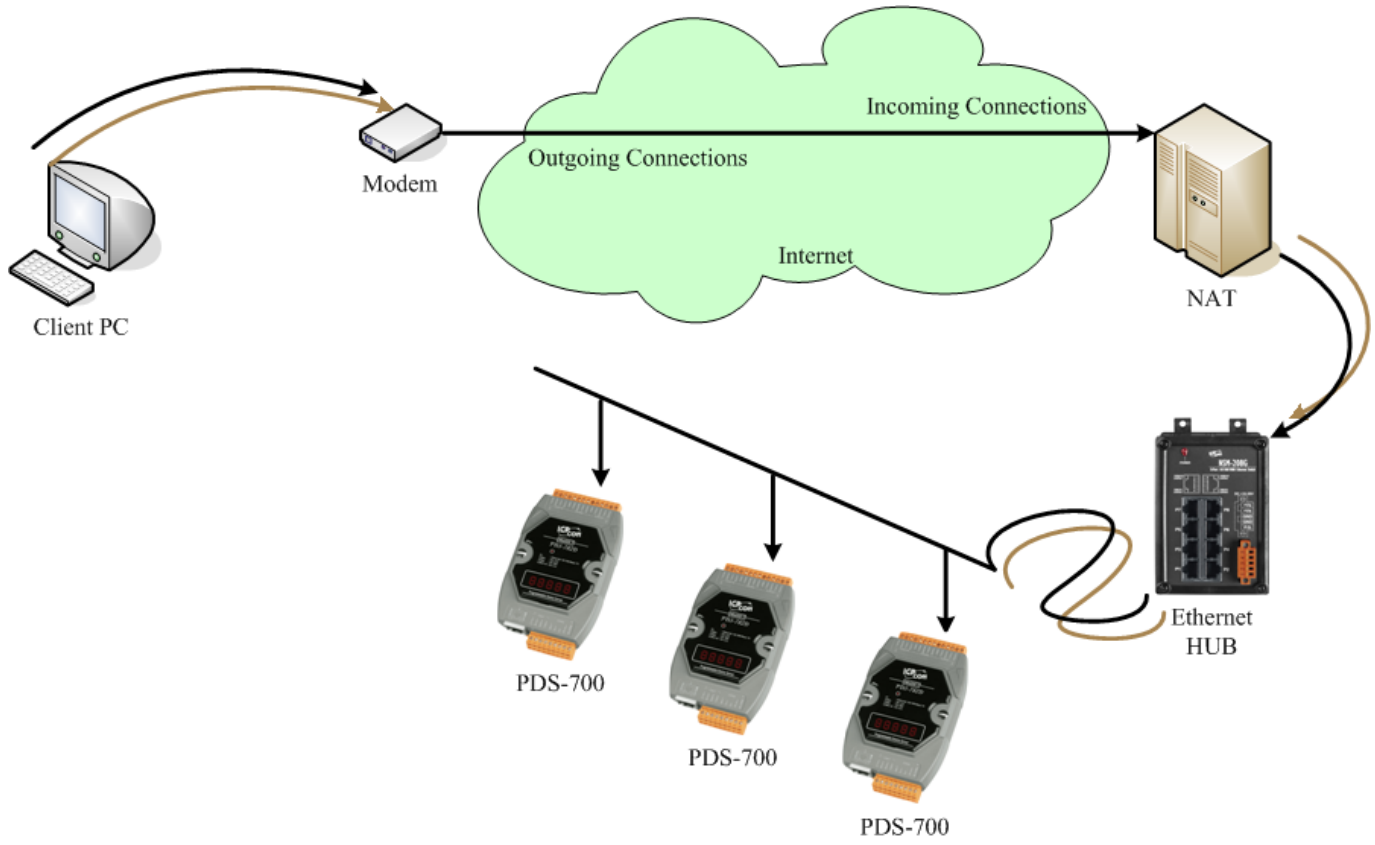
By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary computation and returns the result to the client.

17. Firmware

Firmware is an alterable program located or stored in the semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory.

FAQ

1. How to access the remote PDS-700/DS-700 that placed behind an NAT or firewall?



The remote site must have a NAT (or a router supports NAT) server. NAT stands for Network Address Translator.

By using (configuring) the NAT server, NAT can forword (bypass) all specified tcp port connection to specified PDS-700/DS-700 devices.

For example:

NAT: 10000 ~ 10008 maps to 192.168.1.101: 10000 ~ 10008

NAT: 10010 ~ 10018 maps to 192.168.1.102: 10000 ~ 10008

Please note, if your NAT (router) built-in a firewall feature, you have to configure the NAT to allow incoming tcp port connections.

For example:

Tcp port includes 10000 ~ 10008 and 10010 ~ 10018 of NAT.

In the VxComm Utility, you have to add PDS-700/DS-700 by using NAT's address and NAT's TCP ports instead of PDS-700/DS-700's setting.

For example:

To add first PDS-700/DS-700, it's IP: Port should be NAT: 10000.

To add second PDS-700/DS-700, it's IP: Port should be NAT: 10010.

2. How to open a virtual COM port that larger than "COM 9" by calling CreateFile() Win32 API?

If you want to open "COM 10", the correct way to call the CreateFile() is as follows:

```
CreateFile(
    "\\\\. \\COM10",        // address of name of the communications device
    fdwAccess,              // access (read-write) mode
    0,                      // share mode
    NULL,                   // address of security descriptor
    OPEN_EXISTING,          // how to create
    0,                      // file attributes
    NULL                    // handle of file with attributes to copy
    );
```

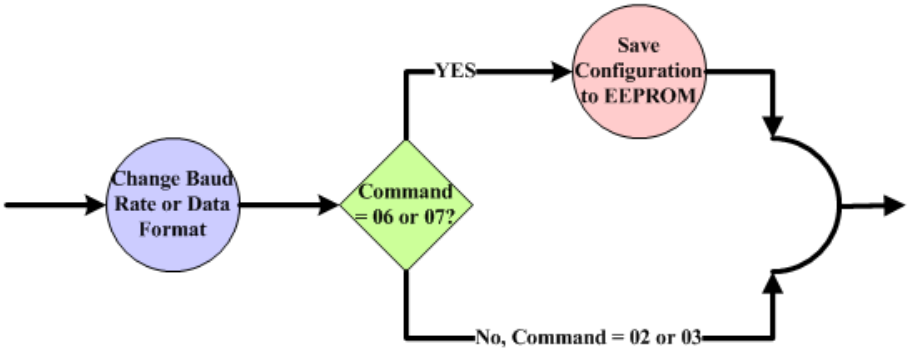
NOTES:

1. This syntax also works for ports COM 1 through COM 9. See more... MS Q115831.
2. Maximum COM port number for VxComm Driver is COM 256.
3. Valid COM port number for MSCOMM.OCX is between 1 to 16. Please refer to MSComm.CommPort.
4. The "\\.\" prefix must be add to the COM port name (device name) when it is larger than "COM 9". But please note that the "\" character is a special escape symbol in C\C++ language, thus you have to use "\\\\.\\" prefix in C\C++ language.

3. Does VxComm Driver (PC) v2.00 work with VxComm Server v2.6.00?

No, please upgrade to version 2.6.14 or the latest version of the VxComm Server. Version 2.6.00 of the VxComm Server (PDS-700/DS-700/7188E/8000E) uses the "06" and "07" command to change the BaudRate and the data format and then saves the configuration in the EEPROM.

The newer versions include the "02" and "03" command that is used to change the BaudRate and data format without needing to be saved. These two commands improve the performance of the Server when changing the configuration settings.



The VxComm Driver (PC) has also been changed to enable the new commands to be used. Thus, users must upgrade their VxComm Server (7188E/8000E/PDS-700/DS-700) to the latest version if the current used firmware is old version (before v2.6.00).

4. Does VxComm Driver (PC) support auto-reconnection after fixing a network break?

Yes, the VxComm Driver (PC) supports the auto-reconnection mechanism in version 2.00 and above. The VxComm Utility allows the user to set the Keep-Alive Time (ms) and Connection-Broken Time (ms) in the server options.

For more details, refer to the "Adding a 7188E/8000E/PDS-700/DS-700 server and configuring the VxComm Driver" section of the VxComm Driver/Utility User Manual.

5. Why doesn't the VxComm Driver (PC) receive data from the 7188E/8000E/PDS-700/DS-700 module?

Make sure that the 7188E/8000E/PDS-700/DS-700 module is operating in mode 0 (/M0). 7188E/8000E/PDS-700/DS-700 module has the following two communication modes:

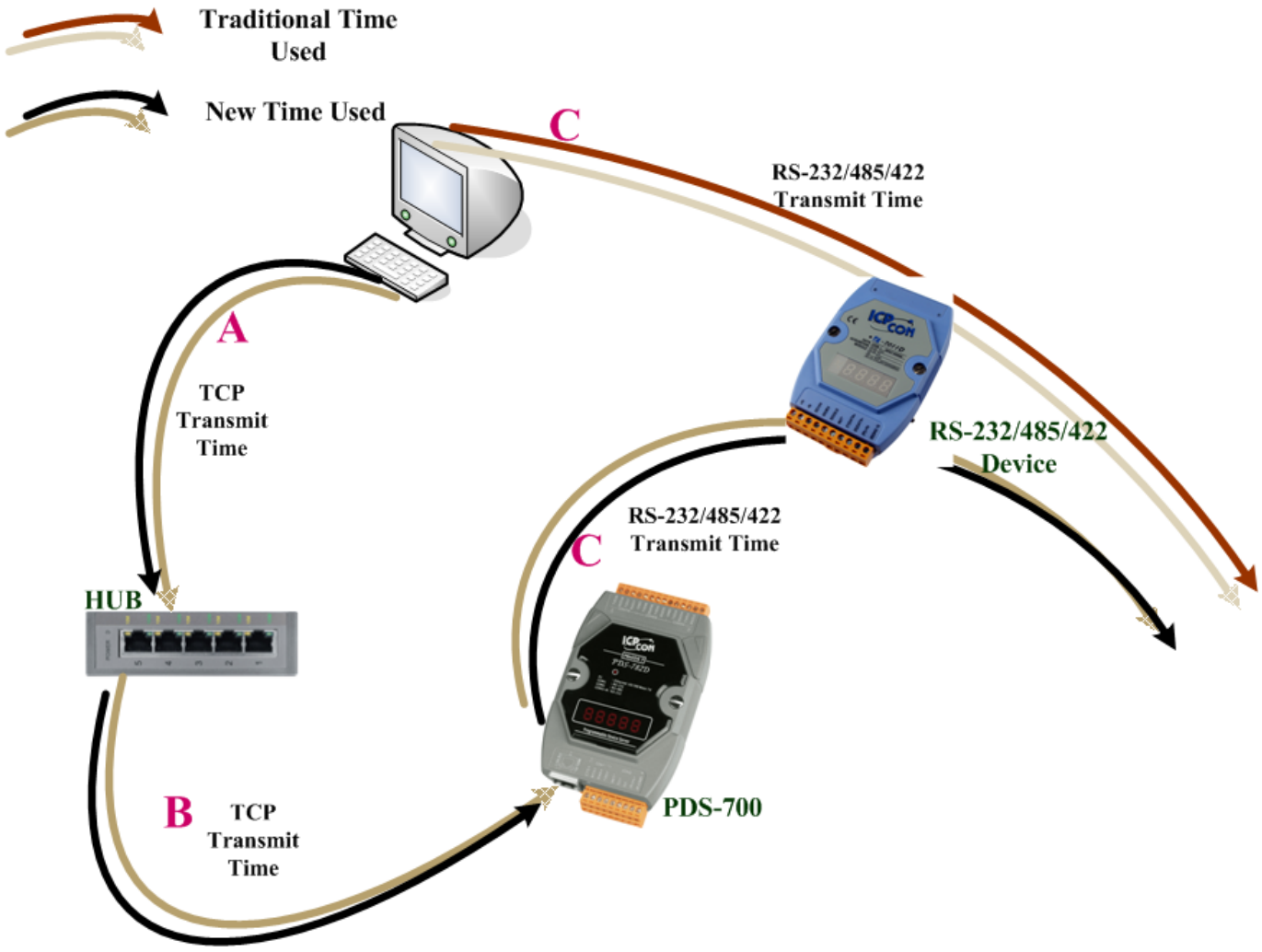
/M0	**Transparent Mode (Multi-echo, shared).** In this mode, data is echoed from the COM Ports of the 7188E/8000E/PDS-700/DS-700 module to each client that is connected to the 7188E/8000E/PDS-700/DS-700 module.	
/M1	**Slave Mode (Single-echo, Non-Shared).** In this mode, data is echoed from the COM Ports of the 7188E/8000E/PDS-700/DS-700 module to the specific client that requested the service.	Version 2.6.12 and above

In /M1 mode, if the client does not send a request to the COM port of the 7188E/8000E/PDS-700/DS-700 module, then the module won't return any data to it. For more information, please refer 5.4 “COM Port Settings” section.

Other reasons causing the problem may be: incorrect wiring, power supply problems IP conflicts, MAC conflicts, an incorrect subnet mask or an invalid IP address. For more details, refer to the "Diagnostics and Troubleshooting" section of the VxComm Driver/Utility User Manual.

6. Does the transmission speed become faster when the serial device working with Serial to Ethernet device servers?

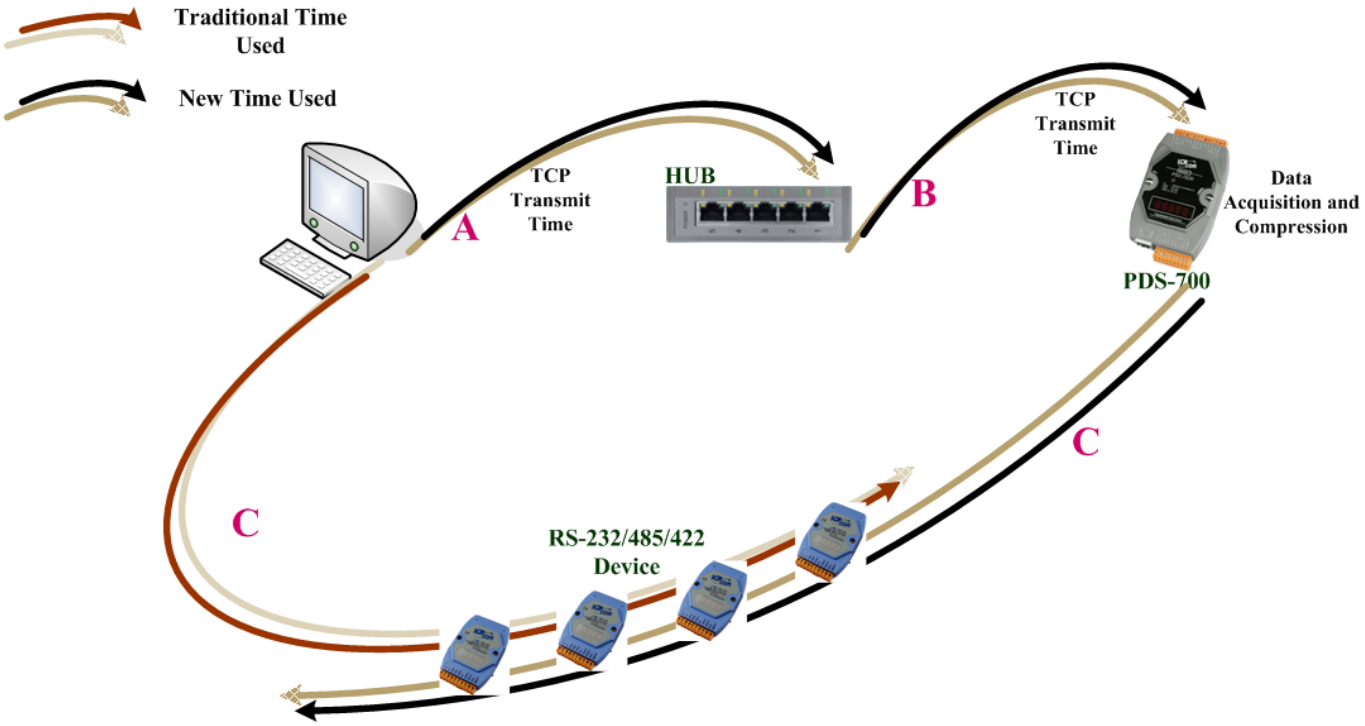
The speed depends on the applications. For transparent applications, it includes Ethernet latency in transmission and may get slower. But you can improve the communication speed by increasing the baud rate since you placing the device server more close to serial device and reduce the communication distance. The higher baud rate should be able to be used in short cable (distance) without communication problem.



Traditional time used	RS-232/485/422 transmit time (C)
New time used	Internet/Ethernet transmit time + RS-232/485/422 transmit time (A+B+C)

(All TCP packets need an extra ACK packet to commit the transmit action. This also causes a little additional delay in communication).

For Xserver applications, it can become faster. User can write their own Xserver applications to acquire data automatically, and then compress and transmit this large amount data at one time. Your application can reach high performance by pre-acquire data before asking by client and then response immediately.



Traditional time used	RS-232/485/422 transmit time (C * n modules)
New time used	Internet/Ethernet transmit time (A + B + C)

7. Why does the 7188E/8000E/PDS-700/DS-700 module fail on a (public) Internet connection?

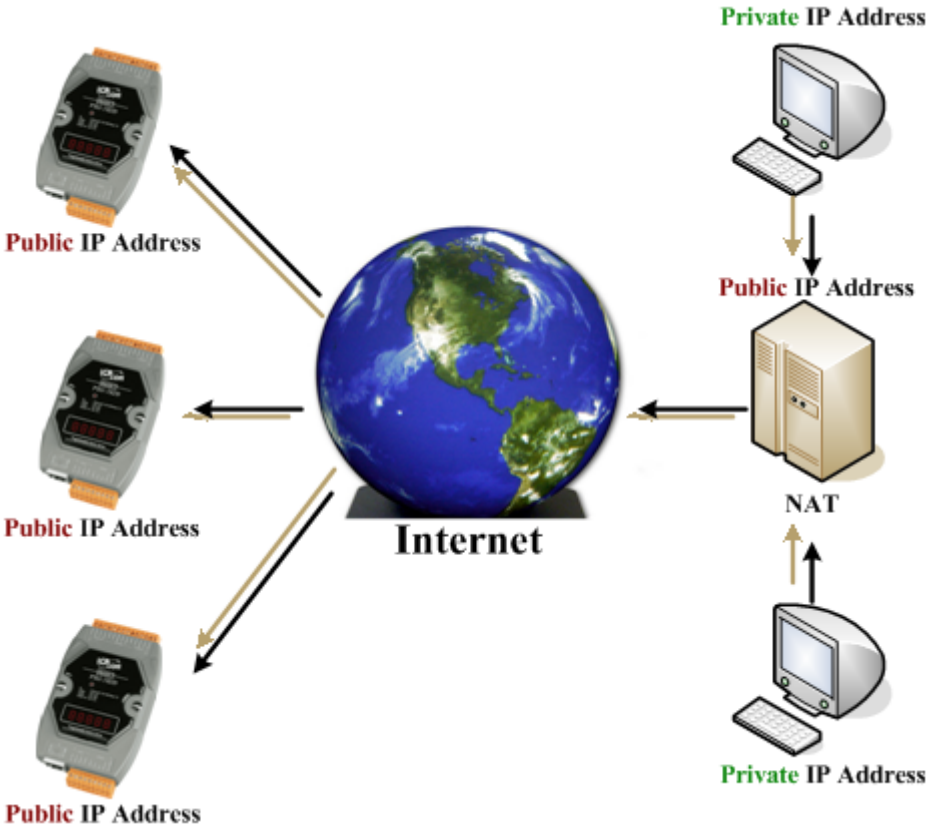
The default IP address of the 7188E/8000E/PDS-700/DS-700 module is 192.168.255.1, which can be only used on a private Internet connection. A private network packet will not be routed via a (public) Internet connection, which is the reason why the 7188E/8000E/PDS-700/DS-700 module failed on the Internet.

The IANA has reserved three address spaces for private internets (RFC1918).

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

The 7188E/8000E/PDS-700/DS-700 module can operate on the Internet using a legal public IP address. This address can be obtained from your ISP or network administrator.

A private internet client may communicate with a public Internet server (7188E/8000E/PDS-700/DS-700 modules) only if the NAT service for the client is available.



Note:

IANA	*Internet Assigned Numbers Authority*
RFC	*Request for Comments*
ISP	*Internet Service Providers*
NAT	*Network Address Translator*

8. Can I use the SetCommState ( ) API to changes the Baud Rate/data format settings of a virtual COM port?

Yes. In a Win32 environment, the CreateFile( ) API should be called to open the COM Port(s) and then the SetCommState( ) API can be used to configure the settings.

Third-party tools may provide an OpenCom( ) function for accessing a COM port. In actuality, the CreateFile( ) and SetCommState( ) APIs must be used to implement these kinds of functions.

9. How many PCs can be connected to a single 7188E/8000E/PDS-700/DS-700 device?

This depends on how many serial ports are available on the 7188E/8000E/PDS-700/DS-700 module and how many serial ports which can be connected to each PC of 7188E/8000E/PDS-700/DS-700.

The 7188E/8000E/PDS-700/DS-700 module has 32 sockets in total includes some reserved listening sockets. The 7188E/8000E/PDS-700/DS-700 module provides a single command port for configuring the data (serial) ports. Thus, no matter how many data (serial) ports on the 7188E/8000E/PDS-700/DS-700 are used, one more socket connection is needed for the command port in order to configure them.

	IO Port	Data Ports	Listening Sockets	Available Sockets	Max. PCs when using all data ports	Max. PCs when using 1 data port
DS-712	0	1	5	32 - 5 = 27	30/2 =15	30/2 = 15
DS-715	0	1	5	32 - 5 = 27	30/2 = 15	30/2 = 15
PDS-720 PDS-720D	0	2	6	32 - 6 = 26	29/3 = 9	29/2 = 14
PDS-721 PDS-721D	1	2	7	32 - 7 = 25	29/3 = 9	29/2 = 14
PDS-732 PDS-732D	1	3	8	32 - 8 = 24	28/4 = 7	28/2 = 14
PDS-734 PDS-734D	1	3	8	32 - 8 = 24	28/4 = 7	28/2 = 14
PDS-742 PDS-742D	0	4	8	32 - 8 = 24	27/5 = 5	27/2 = 13
PDS-742-IP67	0	4	8	32 - 8 = 24	27/5 = 5	27/2 = 13
PDS-743 PDS-743D	1	4	9	32 - 9 = 23	27/5 = 5	27/2 = 13

PDS-752 PDS-752D	0	5	9	32 - 9 = 23	26/6 = 4	26/2 = 13
PDS-755 PDS-755D	0	5	9	32 - 9 = 23	26/6 = 4	26/2 = 13
PDS-762 PDS-762D	1	5	10	32 - 10 = 22	26/6 = 4	26/2 = 13
PDS-775-A PDS-775D-A	0	6	10	32 – 10 = 22	25/7 = 3	25/2 = 12
PDS-782 PDS-782D	0	8	12	32 - 12 = 20	23/9 = 2	23/2 = 11
PDS-782-25 PDS-782D-25	0	8	12	32 - 13 = 20	23/9 = 2	23/2 = 11

Notes:

1. CMD Port = Command Port (TCP port 10000). The CMD Port is used to configure the data ports (TCP port 10001 ~ 10008) of a 7188E/8000E/PDS-700/DS-700 module, such as BaudRate, and data format, etc.
2. The data port (TCP port 10001 ~ 10008, which are mapped to serial ports 1 ~ 8 of 7188E/8000E / PDS-700/DS-700), is only used to send/receive data.
3. The Listening Sockets (for 7188E/8000E/PDS-700/DS-700 modules) = Number of Data ports + 1 CMD port + IO port + Web + Telnet + UDP Search.
4. The number of Available Sockets (for 7188E/8000E/PDS-700/DS-700 modules) = max. (32) sockets - Listening sockets.
5. The maximum number of PCs when using all data ports of PDS = Available sockets/(data ports + 1 command port).
6. The maximum number of PCs when using 1 data port of PDS = Available sockets/(1 data port + 1 command port).
7. IO Port is 9999. (Only support for the module which has the DI/O.)
8. The web uses the TCP port 80. (It can be disabled.)
9. The telnet uses the TCP port 23. (It can be disabled)
10. The UDP search function will occupy one socket.
    - UDP = 0 → Doesn't support UDP search
    - UDP = 1 → Support UDP search and always occupy one socket
    - UDP = 2 → Support UDP search but while has the connection in that UDP search will be stopped.

10. Can I search or connect to PDS-700/DS-700 when my PC's IP address is not in the IP filter list of PDS-700/DS-700? How can I solve it?

A. No, you cannot search or connect to PDS-700/DS-700 when the PC's IP address is not in the IP filter list of PDS-700/DS-700. You can solve the problem by:

1. Add your PC's IP address into the IP filter table of PDS-700/DS-700 by using console command "IPFILTER" in section 8.4.1.
2. Or change your PC's IP address to one of the IP addresses listed in IP filter table.
3. Or disable the IP filter function of the PDS-700/DS-700 by using console command. Refer to section 8.4.1.
4. Or clear all configuration setting on PDS-700/DS-700 by using "config=RESET" command on section 8.4.22. It also clears the IP filter table, password, alias... setting. You have to reboot the PDS-700/DS-700 for loading new configuration.